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Pungwe Gorge, Inyanga District. Photo by Bertram Woods.

THE RHODESIA

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

EXPORT OF MASHONALAND CATTLE.—It is a great satisfaction to us to be able to announce, though the news will doubtless be made public before this appears, that, as the result of further representations made by His Honour the Administrator to the Union Government, arrangements have been made for slaughter cattle to be exported from Mashonaland to the Johannesburg and Pretoria abattoirs on conditions similar to those applicable to Matabeleland, and without the proviso previously made that they should be detained for a period of two months in Matabeleland before despatch.

The markets of the Union are thus now thrown open to the farmers of Mashonaland, and the effect cannot fail to be beneficial and stimulating to the stock breeding industry in that part of the Terriotry.

For the information of those who have not hitherto been interested, but are now able to export slaughter stock, it may be added that permits for such export must be obtained from the Veterinary Department, and that cattle are exported only in sealed trucks, unaccompanied by any hay, forage or grass, and that they must be free of ticks. In no circumstances are any cattle that arrive at Johannesburg or Pretoria from Rhodesia permitted to remain alive, but proceed directly from the truck to the abattoirs.

Wheat Prize.—It will be remembered that an announcement was made, in the April, 1917, issue of the *Journal*, of a prize offered by Messrs. A. F. Philip & Co., Ltd., to the farmer producing the greatest quantity of wheat during the year 1917. The prize consisted of a McCormick reaper and binder, valued at £52 10s. pre-war price. This has been awarded to Mrs. Cashel, Thaba 'Nchu Farm, Umtali district, where 175 bags of clean, winnowed wheat were produced. Mr. R. le S. Fischer was second, with 148 bags, grown on his farm Coldstream Ranche, Headlands. We offer Mrs. Cashel hearty congratulations on her achievement.

The crop statistics published in this issue reveal the interesting fact that the acreage put down to wheat in 1917 exceeded the previous year by 127 per cent., being 4,655 compared with 2,051 acres; a substantial response to the appeal to farmers made by the Agricultural Department to increase their wheat lands. It may here be noted that on the B.S.A. Company's estate at Sinoia 137 bags of wheat were produced on 19 acres of land under irrigation.

The Late W. M. Watt.—We use no mere conventional phrase when we say that the death of Mr. Watt, in December, was felt as a very real loss to this Department, and we believe this feeling is shared by the farming community at large. Mr. Watt was appointed Agricultural Engineer to the Government in July, 1910, and immediately he laid himself out to acquire a first-hand knowledge of local conditions throughout the country. His success in this direction is reflected in the amount and quality of the work he later accomplished. Nearly all the irrigation work so far done in the country was either initiated by him or carried out under his advice. He early realised the desirability of irrigation laws, and he was largely instrumental in securing the passage of the Water Ordinance in 1913, a law which, he often declared, with all its defects, has simplified the control of irrigation water in this country and made impossible the confusion that arises when no unifying Ordinance exists. That Mr. Watt's technical qualifications were of a high order was recognised by all members of his profession with whom he came into contact. His personal services were readily placed at the

disposal of all who needed his help, whether it were a corporation carrying out large works, or a farmer who wished to take out a water furrow as cheaply as possible. Mr. Watt was also a frequent and valued contributor to this *Journal*, and many of the papers he published in our pages are still relied upon as standards for this country in the subjects treated.

After a short illness Mr. Watt passed away on Christmas Day, 1917, at the early age of 39 years. He leaves a widow and four young children, to whom, and to his other relatives in the Cape and Scotland, we extend our deepest sympathy.

Baboons.—We are frequently asked as to the best means of destroying baboons by poison. Without first hand experience, but on the evidence of credible persons, we offer the following alternative methods, reported to be effective:—

Maize grains, moistened till soft, then mixed with red lead and dusted over with it, are sown in ground readily accessible to the baboons, which uncover and eat it, thereby poisoning themselves. It is characteristic of this poison that the baboons after taking it make for water, and frequently die close to or in streams, thereby polluting what may be the drinking supplies of the farm.

Amajodas, cut in fragments and dressed with arsenic or, better still, strychnine, are also recommended. Sometimes the poisoned bait is scattered near the haunts of the baboons only after untreated pieces have been left about for several days in succession, thus accustoming the baboons to look for it, and to have no suspicions of it.

Poisons must not be left to natives to apply, and great care taken to avoid unintended consequences.

Notice.

The Editor has received a postal order for 5s., evidently a subscription to the *Journal*, bearing the date of the Salisbury issuing office, 22nd January, but accompanied by no document to indicate who the sender is.

Will the gentleman who forwarded this money please communicate his name, so that he may be duly credited.

Report on Crop Experiments at the Government Farm, Gwebi,

SEASON 1916-17.

By Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.

PART III.

Wheat.—The cultivation of summer wheat is a problem to which attention has been given for several years. In winter under irrigation, or on naturally moist land, this crop is successfully grown, and is being more and more extensively sown every year. In summer under rainfall the rust fungus has invariably made itself manifest and killed all varieties which succeed in winter. During past years a great number of different kinds of wheat have been tested for summer sowing, but none has proved entirely resistant to rust; in fact, the only sort found to withstand the disease sufficiently to warrant further trial has been Yellow Cross wheat, with which experiments have been continued this season. To this end, 10 acres of Yellow Cross wheat, following maize the previous season, were sown at the rate of 35 lbs. per acre on the 22nd December, 1916, drilled 18 inches apart and harrowed once. The crop was ripe and harvested on the 29th and 30th March, 1917. A number of different manurial applications were applied before the seed was sown, and five weeks after the seed had been put in, all the plots treated with artificial fertiliser shewed marked superiority both over the control plots that had been unfertilised and over those to which lime had been given. Growth was stunted through lack of rains, and early in March rust appeared, but did not prevent the grain from forming in the ears, though no doubt the yield was diminished on this account as well as owing to the drought. The plots which received no fertiliser yielded only 205 lbs. of grain per acre. In the previous year, when the rain was also deficient, although there was no rust, the control plots gave 235 lbs. per acre. The addition of a ton of lime appears to have been of no benefit, as the yield was practically the same, viz., 215 lbs., and the cost of the lime must therefore be regarded as lost. The best result was obtained from an application of Bain's Maize Fertiliser, being 370 lbs. of grain per acre, which is a return of over 10½ bags for one sown. The results obtained by the various fertilisers used are indicated below:—

Horses on Rhodes Inyanga Estate, 1915. Photo by Bertram Woods.

Fertiliser applied.	Yield of Wheat per acre.
100 lbs. Bain's Maize Fertiliser	370 lbs.
100 lbs. Safco Rhodesian Maize Fertiliser	347 ,,
200 lbs. Salisbury General Fertiliser	285 ,,
Bain's Potato Fertiliser	275 ,,
50 lbs. Safco Double Complete Fertiliser	260 ,,
2,000 lbs. lime	215 ,,
Nil	205 ,,

Oats.—The advantages of growing oats in summer are obvious. Crops grown under rainfall require much less labour and attention than do those grown by irrigation. Summer-grown oats give a useful opportunity for resting the soil from too frequent maize growing, giving a profitable and marketable crop which requires no laborious cultivation or care when such labour has to be concentrated on the maize crop. The one difficulty to contend with is rust, to which most varieties of oats that have been tried succumb during the summer months. This crop is to be contrasted with Boer manna, but in these experiments it was not cut for hay but allowed to mature, owing to the demand for seed. The weight of oat hay, owing to its condition when cut, would have amounted to considerably more than that of the mature crop, which without fertiliser yielded in one case 390 lbs.; in another case 482 lbs. of seed oats and about 800 lbs. of straw. In the previous year the corresponding plots yielded 540 lbs. of grain. One plot of 10 acres was grown for the purpose of supplying seed; another of 5 acres was devoted to manurial experiments, and again confirms the superiority of kraal manure, the ineffectiveness of lime for this crop, and a moderate increase where artificial fertilisers were applied. The seed drill was used for putting in this crop, at the rate of 18 lbs. per acre, on 15th December, 1916, and the crop looked well at first, but came into ear early and short on account of the season; rust appeared on the leaves at a date subsequent to that at which it would have been normally cut for hay, and also too late to affect the quality of the grain. Unfortunately, the sample of seed was somewhat damaged in appearance by late rains after it had been cut, an injury which is, however, more apparent than real. The yields from the various plots are given below:—

Fertiliser applied.	Yield of Grain.
7 tons kraal manure	730 lbs.
100 lbs. Safco Rhodesian Maize Fertiliser	600 ,,
100 lbs. Bain's Potato Fertiliser	430 ,,
Nil	390 ,,
2,000 lbs. lime	350 ,,

The cost of growing this crop, apart from manures, was £1 5s. 7d. per acre; thus a fair profit was obtained apart from any benefit from the fertilisers.

There were three oat plots in the rotation experiments this year. The Kherson variety has after a number of years proved its suitability for summer culture, for although it takes rust, it appears generally that this fungus does not attack it sufficiently early to damage it if grown

for hay, and that even if left for seed, as in these experiments, the grain crop is not seriously injured for seed, although it may lose something in weight and appearance. The summer grown oats offer good opportunities to the farmer to introduce a profitable rotation crop in the place of maize, and one which in addition requires little or no attention from the date of sowing until harvest, particularly in this respect not requiring the cultivation needed for maize, velvet beans, ground nuts, potatoes, mangels and so forth. Oats leave the land in good condition for subsequent crops, although their precise effect in the rotation cannot yet be fully determined.

A good seed bed was prepared, and the oats drilled in on the 14th December, at the rate of 17 lbs. per acre, and harrowed once thereafter. This season the straw was not long. Rust appeared only as the crop was ripening, and if cut as a hay crop, the yield would have approximated two tons, but it was allowed to ripen and only harvested on the 24th March, when the yields of the three crops were respectively 315, 320 and 614 lbs. of grain per acre, the latter being rather above the average of the last five years, and the two former considerably below it. The first two plots received a top dressing of nitrate of soda, but as no rain fell to dissolve it, the crops could not benefit by it. The third plot received 150 lbs. of Bain's Maize Fertiliser per acre at time of sowing.

Manna.—Boer manna has over a succession of years always proved a satisfactory crop on the Government farm. Good and profitable returns have usually been obtained. In the under-mentioned experiments the best yield was $2\frac{1}{4}$ tons per acre, which, at current market prices, leaves a very satisfactory return. The bare cost of production, apart from fertilisers used, was £1 0s. 11d. per acre. Five acres were sown on the 13th December, broadcast, using 10 lbs. of seed per acre. This was harrowed in, and the crop received no further attention until cut for hay on the 21st March.

In experiments on similar lines to this with other crops, it was very noticeable that lime had no beneficial effect. In this instance, however, the reverse was the case, the lime plot being obviously to the eye, before the harvest, by far the best, whilst little difference was observed amongst the manured plots. This remarkable result is most noteworthy and opportune at a time when artificial fertilisers are becoming extremely difficult to obtain, whilst lime is becoming more readily procurable, and there is a need of discovering the crops which can be most benefited by it. The results of the experiments are as follows:—

Fertiliser applied.	Yield of Manna per acre.
2,000 lbs. lime	4.480 lbs.
200 lbs. Salisbury General Fertiliser	3,360 ,,
1 acre nil	2.840 ,,
100 lbs. Safco Rhodesian Maize Fertiliser	2,700 ,,
100 lbs. Bain's Potato Fertiliser	2,400 ,,

As Salisbury General Fertiliser contains a considerable amount of lime, and the artificial fertilisers referred to both contain phosphates in

an acid condition, it would appear as if the actual diminution of the crop in the last two instances is probably due to this acid condition. As is well known, lime should not be added to superphosphates or to mixtures containing superphosphates, and therefore it would probably not correct the defect of the last two fertilisers to have added lime in addition to them to the plots.

One plot in the rotation experiment consisted of Boer manna, of which the following are the particulars:—After a crop of cow peas, the land had been ploughed, rolled and disced in the winter, and a fine seed bed prepared before sowing at the rate of 11 lbs. per acre, broadcast by hand, on the 5th December. Bain's Fertiliser at the rate of 150 lbs. per acre was applied, and the crop came up thick. Perhaps a lighter sowing would have been more advantageous. It grew well, and withstood unfavourable conditions. The first cutting was made on the 28th February, when the crop was standing about 3 feet high, and amounted to 1,617 lbs. per acre. The second growth was cut when about 15 inches high, and yielded 580 lbs. per acre, or a total of 2,197 lbs. per acre. The cost, including fertiliser, was £2 10s. 2d. per acre.

Linseed.—This crop has been most disappointing this year, although profitable in view of the high value of the linseed. Insects proved rather troublesome, and the crop was at one time very weak, but recovered surprisingly from the late rains, as growth and flowering recommenced, and the final yield was heavier than at one time looked for. The linseed was sown with seed drill in rows 8 inches apart, using 22 lbs. per acre on a well prepared seed bed. It was sown on 18th December, harrowed once, and pulled by hand on the 18th April. The returns are as follows:—

Fertiliser applied.	Yield of Linseed per acre.
7 tons kraal manure	350 lbs.
100 lbs. Safco Rhodesian Maize Fertiliser	240 ,,
100 lbs. Bain's Potato Fertiliser	210 ,,
2,000 lbs. lime	200 ,,
Nil	190 ,,

Linseed was only grown on one plot of the rotations. It followed sweet potatoes, and received a top dressing of 50 lbs. nitrate of soda per acre. The seed was drilled in at the rate of 16 lbs. per acre on the 13th January, and unfortunately struck the dry spell, growing very short and thin, and yielding only 115 lbs. of seed per acre, which is half of a fair crop as grown on the farm in past years.

Buckwheat.—In the rotation, mangels hold an important place. Unfortunately last year the seed did not arrive from England, owing to war causes, in time for planting. The ground was kept for the seed till the last minute, and then, when there was no further prospect of successfully growing mangels that year, the land was utilised by a catch crop of buckwheat.

This crop has the advantage of growing very rapidly, and gave a return when it would not have been possible to have put in any other crop. It is noticeable that buckwheat is, however, very dependent on

weather conditions during its short period of activity. A heavy shower in one instance immediately after sowing exerted a very marked difference as against land that remained dry for some time. A similar observation had been made where buckwheat had been sown shortly before or shortly after a good shower, the latter crop being much better. The seed was sown at the rate of 18 lbs. per acre on well-prepared land. The returns from three plots were respectively at the rate of 197, 434 and 438 lbs. per acre.

Dhal.—Observations were made on dhal in the second and third season on the same ground. In the plots now three years old a considerable proportion, amounting to almost a third of the plants, had died out. Beetles proved very destructive to the flowers, and a considerable amount of labour was involved in collecting and destroying them. Flowering commenced in the beginning of February, and by the middle of April a fair number of pods were formed on all the plants, but reaping was not commenced until the first week in June. Late frosts had cut down the plants without killing them, and with the first severe cold the flowering and maturing of the pods, not yet ripe, ceased. Intentionally part of the crop was harvested by cutting and part by picking on the spot. Cutting evidently retarded development of the plants materially, and caused them to flower nearly a month later than the remainder, and to ripen correspondingly later. This crop, subjected to early frosts, points to the desirability of not cutting over the dhal, but gathering the pods off the growing stems each year. In addition to the ordinary white variety, best known in this country, a mottled dhal has also been grown. It is a taller plant, but it is very late in maturing, and therefore not to be recommended. Three other varieties received from India, in response to a request to be supplied with early-maturing varieties from that country, were tried alongside the ordinary white dhal. These shew great differences of habit, some being quite low shrubs and probably comparatively light yielders. As they were received from India somewhat late, they did not get the benefit of the early rains, but on the whole they did not give a favourable impression. These, and a number of other varieties since received, are being tried at the agricultural laboratories, Salisbury, where conditions seem to be much more favourable for this crop than the comparatively exposed, cold, bare Gwebi flats. Different fertilisers were applied, and it was again brought out that lime was ineffective, and that kraal manure was preferable to artificial fertilisers, viz. :—

Fertiliser applied.	Yield per acre.
7 tons kraal manure	560 lbs.
100 lbs. Safco Rhodesian Maize Fertiliser	315 ,,
1,000 lbs. lime	250 ,,
500 lbs. lime	245 ,,
Nil	265 ,,

Potatoes.—The following particulars regarding field grown potatoes may be of interest. The variety used was Up-to-date, obtained from seed previously grown on the farm. Seven tons of manure per acre were used, and the crop was planted on the 10th October, 1916, at the rate of 1,000 lbs. per acre. The crop was kept well cultivated, and was lifted

Rhodes Inyanga Estate, general view. Photo by Bertram Woods.

Pungwe River, near source, Rhodes Inyanga Estate. Photo by Bertram Woods.

on the 26th April by means of a ridging plough. The crop blossomed in December and matured by the 1st March, after which the soil was earthed up over the ridges to lessen the effects of the moth, but the crop was left in the ground until lifted for selling as required. The yield amounted to 11,160 lbs. per acre, and the price obtained varied from 11s. to 14s. 6d. per bag of 150 lbs. This is by no means an unusual crop for the district, and even at these comparatively low prices it is quite profitable. It is also the heaviest root crop obtained on the farm, exceeding in this respect sweet potatoes.

Sweet Potatoes.—Sweet potatoes are not as much grown in this country as their merits warrant, both for human consumption and for cattle feed. Although under equal conditions at the same time on the experiment farm they yield a less return per acre than the common potato, they are less subject to diseases, and have better keeping qualities. The much larger size of individual tubers is also an advantage in the lifting and handling of the crop as a cattle feed; moreover, the tops furnished 7,500 lbs. of valuable green fodder per acre, which was converted into excellent silage in conjunction with Napier fodder. The yield of roots was 9,650 lbs. in the case of the Natal variety, and 8,700 lbs. for the calabash variety, which is the earlier maturing of the two. These crops were grown without any manure on ordinary red soil, in a dry year and following a crop of maize. The crop is certainly one which, on account of its ease of cultivation, deserves much more consideration than it has hitherto received.

Majorda *v.* Makataan.—The relative merits of these two native gourds well deserve to be compared. To this end a piece of new land was utilised, and although it was by no means rich, quite satisfactory crops of both varieties were grown. The seed was planted 12 feet square, using only 3 lbs. of each per acre, and two acres of each crop were grown. They were planted on the 28th December, 1916, hand-hoed twice and gathered off the field during August, since when they have been utilised for stall-fed cattle. It became apparent that the makataan might with advantage be sown more closely, as the plants have not completely covered the ground. Had this been done, no doubt a heavier yield would have been obtained, but in any case possibly not as much as was yielded by the majorda crop. The cost of production may be taken at £1 4s. 4d. per acre, and the returns for majordas were 12,250 lbs. per acre, and for makataans 5,700 lbs. per acre.

Majorda melons were also sown as a rotation crop, planted 12 feet by 12 feet, using 4 lbs. seed per acre, put in early in the season, on 6th November. This crop appears to suffer from heavy rains, and to withstand drought to an exceptional degree. The yield was 13,750 lbs. per acre, as against 30,500 lbs. in the previous year, when, however, the crop was sown after potatoes which had been dunged, whilst this season they followed a maize crop.

The Maize Beetle

(*HETERONYCHUS MASHUNUS*, PERING.).

By Rupert W. Jack, F.E.S., Government Entomologist.

The beetle illustrated in the accompanying plates has been the cause of heavy loss to maize growers in various parts of the Territory for a number of years past. So many complaints of its ravages have reached the Department, that it seems advisable to put into print what is known about the pest at the present time, together with such suggestions as it is possible to make concerning methods which may prove of value in checking its attacks.

It may reasonably be objected that it is preferable to test remedies in the first place rather than to publish suggestions, and with this the writer is in complete agreement. Unfortunately, almost all the outbreaks occur on farms at a great distance from Salisbury, whilst at the present time the entomological branch is short-handed, owing to the war. It is therefore obvious that, notwithstanding the importance of the present pest, it is not possible to carry out the extensive and prolonged experiments required to establish the value of any of the suggestions made, until more normal conditions prevail. For the present the most that the writer is able to do is to explain the life history and habits of the insect, as far as these are known, and to indicate lines along which farmers might experiment on their own behalf.

Description and Life History.—The adult beetle averages about five-eighths of an inch in length, the males being generally slightly smaller than the females. The variation in size is, however, considerable. The smallest specimen in the office collection, a male, is about seven-sixteenths of an inch in length, and the largest, a female, measures three-quarters of an inch. The colour is shining black, and the general appearance as shewn at Fig. 1 on Plate I. There are several species of beetles, not known to be injurious, which have a very similar appearance to this pest.

The beetles become active with the first soaking rains of the season. During the day they remain under the surface of the soil. It is probable that they mostly move about on foot, but they are capable of flight, and are sometimes attracted to lights after dark. A moist environment is absolutely essential to them, specimens confined in a cage with dry soil dying *en masse* within a few days, whilst others supplied with wet, sometimes very wet, soil, have lived for six to twelve months. The length of life of the beetles in nature is difficult to ascer-

tain. Specimens have survived for a year and more in confinement, the soil being kept thoroughly wet throughout the winter. Whilst it would seem that conditions in the artificially moistened cages are paralleled in soils of a permanently wet character, it is nevertheless unlikely that a large proportion of the beetles survive the winter in the field. Beetles which lived over from November in the cages continued laying eggs right through to October, and the grubs, hatched from eggs laid in September and October, were quite large by the middle of November. In a permanently moist situation where the beetles were exceedingly numerous, however, Mr. R. L. Thompson, Assistant Entomologist, in the middle of November failed to find any grubs at all, though his excavations revealed large numbers of pupal cells. It has been our experience with other species of beetles that they may be kept alive, and even breeding, in cages considerably after they have disappeared or become very scarce in the field. In nature insects are subjected to extremes of heat and cold, as well as to the attacks of their natural enemies, which are avoided or very much mitigated in confinement. From the accounts given by a number of farmers, it appears that the beetles are not in evidence to a noticeable extent after February, and it may be assumed with little risk that, for all practical purposes, adult existence terminates with the advent of winter.

The eggs are laid in the soil throughout the wet season. They are opaque white in colour, and, as in the case of other members of the family, increase in size during incubation. The egg outlined at Fig. 4 on Plate I. was 3-4 days old, and measured 2.07 m.m. by 1.75 m.m., a millimetre (m.m.) equalling about one twenty-fifth of an inch. Measured again eight days later, the dimensions were 2.32 m.m. by 2.07 m.m., the shape being as shewn at Plate I., Fig. 5. In confinement, the eggs were laid from one to five inches below the surface of the soil, in little pockets in the sides of the tunnels of the beetle. The incubation period is about fifteen days.

The young larva or grub is more slender and active than the older form, and is able to straighten its body quite readily. It generally has a greyish appearance, owing to the soil distending its digestive organs. When mature, the extreme length is about an inch and a half. A mature specimen is shewn at Plate I., Fig. 3. There is nothing characteristic in the appearance of the grubs, which resemble those of hundreds of other species of the same family.

The grub apparently feeds entirely upon decayed vegetable matter in the soil, to obtain which it passes quantities of soil through its body. There is no evidence that the insect is in any way injurious to plants during this stage of its development. In a suitable environment, the growth of the grub is rapid. One specimen, hatched 30th November, measured 25 m.m. (one inch) on 24th January, whilst another, hatched out on 23rd February, was 20 m.m. long on 20th March and 30 m.m. on 26th May. Between that date and 4th August, when the insect was preserved, practically no growth was made at all. A third specimen hatched on 2nd March, and by 20th March measured 15 m.m. On 26th May this larva also measured 30 m.m. In a fourth record, a number of larvæ hatched on 20th October. By 31st October six had

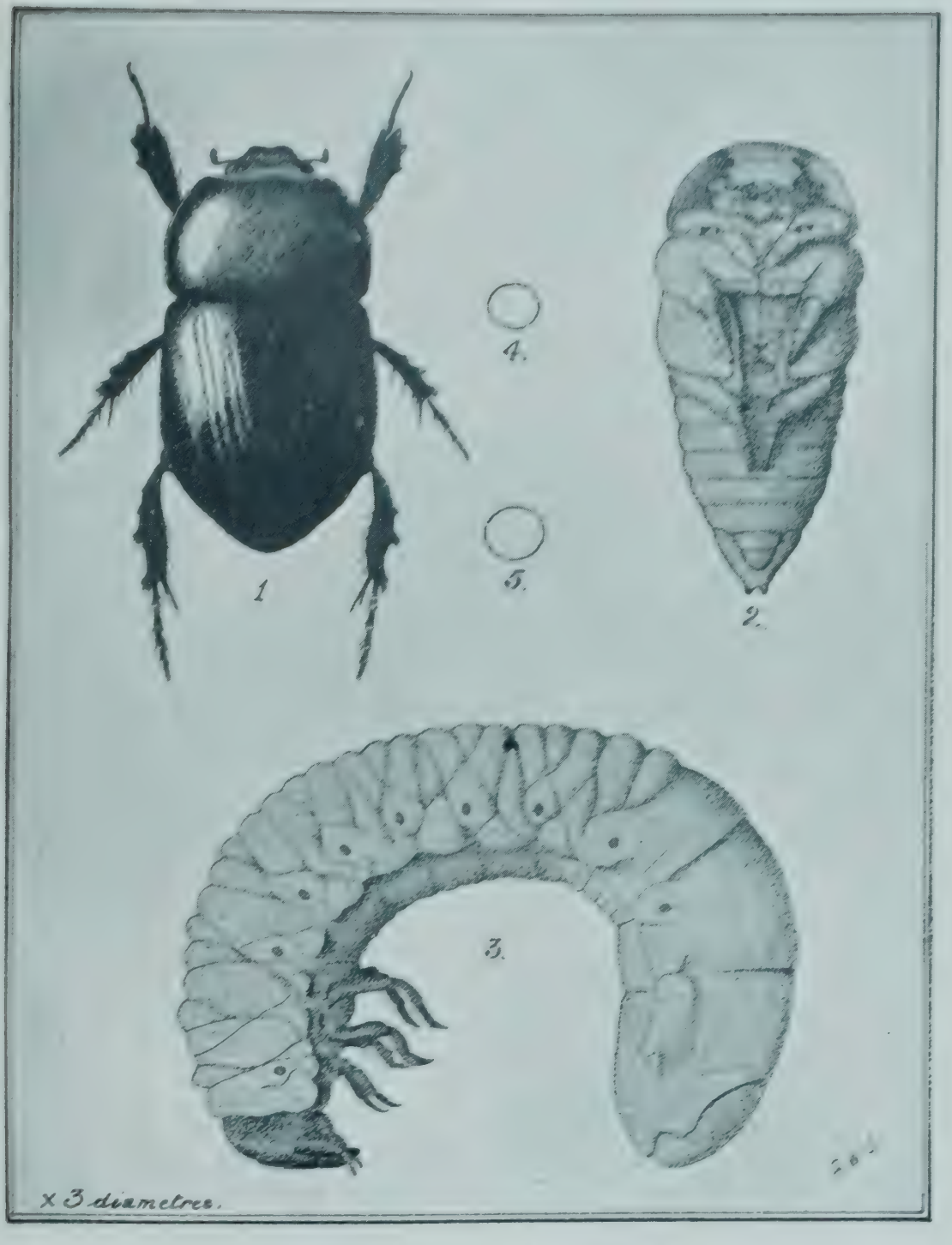
attained a length of 20-23 m.m. By 28th January four of these were full-fed. In a fifth instance, some very young larvæ (6 m.m. in length) were isolated on 9th October. By 20th October three were 25 m.m. (one inch) and one was 15 m.m. long. Two had pupated by 2nd December and three by 5th December. An adult beetle appeared 28th December. A sixth experiment consisted in isolating six adults, which had been in the cages for eleven months, in a pot with fresh soil on 9th October. On 17th November about twenty grubs of from 6-20 m.m. and six eggs were present. On 17th March the pot contained one dead pupa and about twenty full-fed grubs.

All records indicate that the beetles became active almost with the first heavy rains of the season, usually early in November. Egg-laying would normally coincide with the rains, but under artificial conditions it is possible to induce the insects to breed during the dry season by keeping the soil in the cages wet. Grubs hatching out in the wet season remain in this stage over the winter. Those hatching out in September and October seem to develop very quickly, and produce adults in December, January and February. It is to be noted that the growth of the grub is acquired almost entirely during the rains.

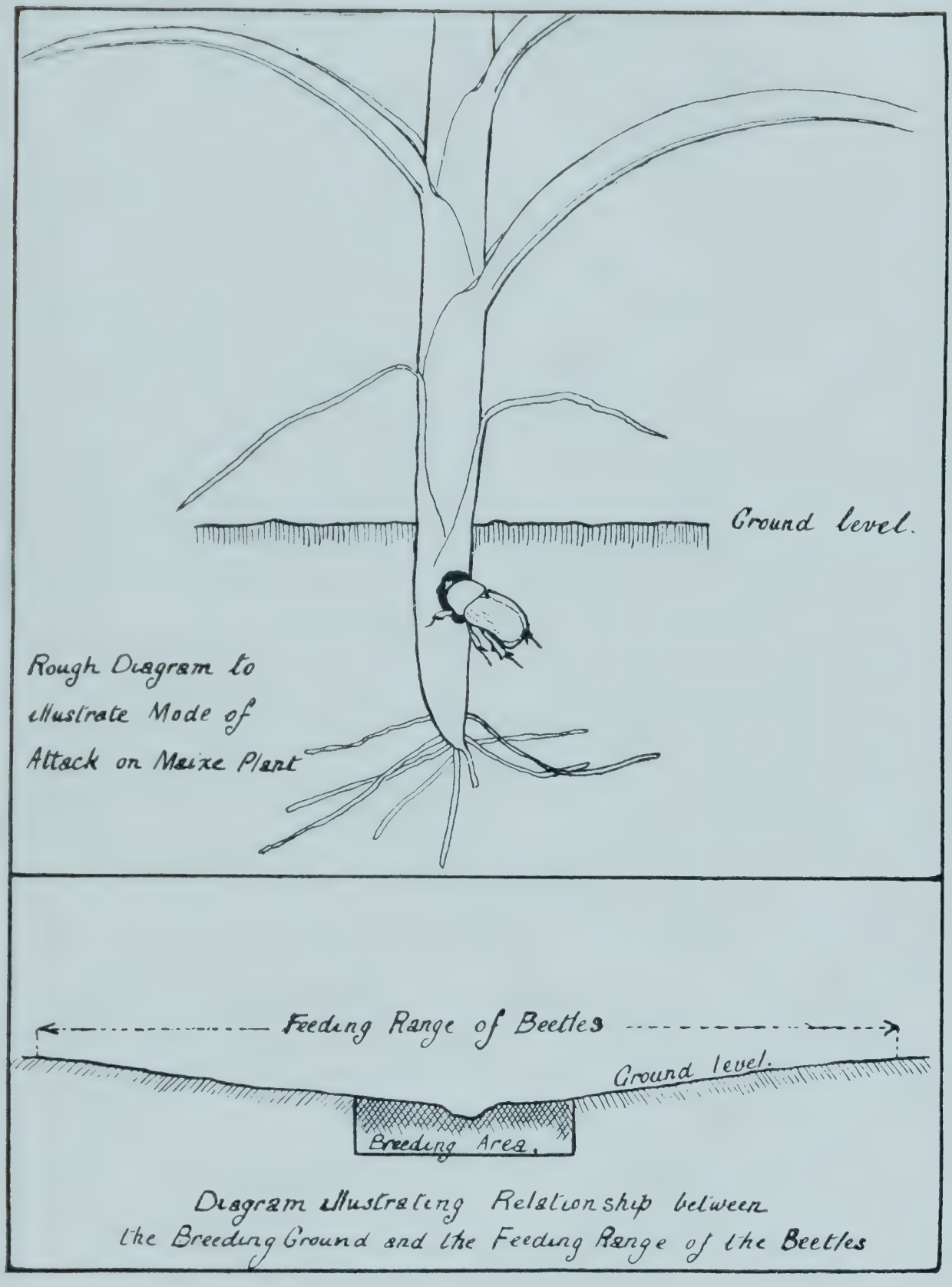
Whilst it is known that the winter is passed mainly in the grub stage, and that the beetles are active at the commencement of the wet season, there is some doubt as to the month in which the majority of the grubs pupate. It is believed that this occurs during the latter part of September and early October, but it may possibly be somewhat earlier, as beetles of this family frequently leave the pupal skins and rest for some time inside the cells until conditions are favourable for their existence outside. It is to be noted that as late as 11th to 14th November, Mr. Thompson found considerable numbers of adult beetles resting within pupal cells in the soil, most of these quite hard and ready for active life. Beetles had been injurious on this soil at the beginning of the month, but the intervention of a dry spell had presumably prevented the less forward members from leaving the cells. These would be from grubs which had not completed their growth before the advent of winter, and they would therefore enter the pupa stage later in the spring, and thus be insufficiently developed when the first rains stimulated the bulk of their fellows into an active life. Within these cells they would rest until the next soaking rains produced favourable conditions for them outside.

The pupa is shewn at Plate I., Fig. 2. At first it is quite white, but as development proceeds, it acquires a brownish tint. Pupation takes place in an earthen cell in the soil. In the field, Mr. Thompson found the majority of pupæ at a depth of about four inches from the surface. None was found deeper than six inches. The pupal period was in one instance found to occupy between three and four weeks.

Food Plants.—All complaints which have reached the office have been in connection with attacks on maize. It is probable that the natural food of the beetles consists entirely of more or less succulent grasses. As far as is known, any crop not belonging to the grass family (*Gramineæ*) may be planted with perfect safety on infested soil. In



The Maize Beetle. Plate I


Ground level.
Rough Diagram to illustrate Mode of Attack on Maize Plant
Feeding Range of Beetles
Ground level.
Breeding Area.
Diagram illustrating Relationship between the Breeding Ground and the Feeding Range of the Beetles

The Maize Beetle. Plate II.

the laboratory at Salisbury cages containing the beetles were planted with the following:—Maize, kaffir-corn, wheat, oats, barley, linseed, cowpeas, French beans, velvet beans, clover, dhal, sunflower, castor oil, majorda melon, vegetable marrow and potato tubers. The first five were attacked more or less freely, the remainder not at all. When in a partially starved condition, however, caged specimens have been induced to eat into potato tubers, but there is no record of noticeable injury to this crop in the field.

Nature of Injury.—The beetles will attack the seed as it germinates, and the plant at almost any stage during growth. The young shoot from the seed is frequently destroyed, so that the plant does not appear above ground. The injury to the larger maize plants is characteristic. The beetle eats into the stalk an inch or two beneath the surface of the soil, and the centre of the plant withers, commonly leaving the outer leaves still green (see Plate II.). After the plant has withered, the insect seems to leave it and seek a fresh one, thus doing the maximum amount of damage in proportion to its numbers.

Distribution.—The Maize Beetle appears to be most prevalent in the neighbourhood of Lalapanzi and Iron Mine Hill, in the Gwelo district. It has also been recorded as a pest on one farm in the Salisbury district, at Macheke, and in the Hartley and Makoni districts. A beetle of similar habits, which, however, has proved to be a distinct species, has done a considerable amount of injury near Shangani. Finally, the type specimens from which Dr. Peringuey described the present species were taken at Mazoe. It is, therefore, apparent that the pest is widely distributed in Mashonaland and parts of Matabeleland, and that the presence or otherwise of suitable breeding grounds determines whether or not it is able to increase sufficiently to constitute a serious pest.

Nature of Soil Favoured.—It appears certain that the grubs can only thrive in low-lying soils rich in humus. In confinement, the grubs have grown well in soil mixed with well-rotted kraal manure. A damp environment is essential to their existence, and presumably the soil should not dry out to too great a depth during the winter. The dependence of the grubs on rich soil is doubtless due to their method of feeding, poorer soils containing insufficient nourishment to sustain the growth of the insect. As far as is known, decaying vegetable matter forms the food of the majority of the members of the sub-family (Dynastides), but some members, as, for instance, the Rhinoceros Beetle (*Oryctes boas*), live in rotten manure. Grubs of similar appearance to those of the Maize Beetle found in soils of medium or poor humus content belong to other sub-families of the *Scarabæidæ*, and feed largely on the roots of plants.

Although the grubs are dependent upon rich low-lying land, the beetles range farther afield, and may do damage on lighter soils adjacent to the breeding ground (see diagram on Plate II.). In some cases the ravages have extended two hundred yards or more up the slopes from the lowest dip of the land. The plants on or nearest the breeding ground, however, naturally suffer to a greater extent than those more remote.

It should be stated that whilst the pest is frequently injurious on newly-broken land, most damage has been recorded on soils that have been under cultivation for several years. It is possible that ordinary cultivation tends to favour the pest, by making the soil more easily penetrated by the grubs. As they are not dependent upon growing plants for nourishment, the lack of the natural vegetation would not affect them in any way.

The Question of Remedies.—Numerous experiments have been made with a view to attracting the beetles to a poisoned bait consisting of arsenic in sugar or treacle solution, but these have uniformly failed. The position is, therefore, that beyond the obvious remedy of putting picannins to collect and destroy the pests—a very slow method, which is, however, commonly practised—we are at present without a means of saving a crop when once attacked. Under these circumstances, attention must be devoted to the possibility of adopting measures to check the undue increase of the beetle.

The Question of Prevention.—Any effective method of destroying the pest in its earlier and non-injurious stages, or of rendering its breeding places unfit for its use, may be regarded as a preventive measure. The following methods, *which apply to the breeding places only*, appear to the writer to be worth testing:—

(1) *Drainage.*—The dependence of the grub on damp conditions has been definitely proved. It follows, therefore, that where practicable, and not otherwise undesirable, improved drainage is likely to check the increase of the pest.

(2) *Maximum Drying out in Winter.*—By ploughing the area late in the summer, and leaving the surface in ridges over the dry season, the land should dry out to a greater depth than would otherwise be the case. This practice might therefore be of assistance in some cases.

(3) *Working the Surface in September-October.*—As far as is known, the major portion of the insects are in the pupal stage, encased in earthen cells in the soil, in late September and the first part of October. These cells have not been recorded from a greater depth than six inches, and are thus within reach of the plough. Cells constructed in the breeding cages at Salisbury have not been sufficiently hard to resist much disturbance and pressure, whilst the pupæ themselves are delicate and must undoubtedly perish if the cell is broken. By ploughing and cross-ploughing from, say, about the beginning of October, and breaking up the soil as much as possible, great numbers of the cells should be crushed, and the inmates destroyed. A clod crusher would be of service in this connection.

(4) *Use of Swine.*—Swine are very fond of the grubs of this family of beetles, and are used in other parts of the world to destroy "white grubs" which attack the roots of plants. They are generally penned on the infested soil. If sufficient in numbers, they are reported to root the soil over thoroughly

and devour or destroy most of the grubs present. By moving the pen as soon as the enclosed soil has been turned over, a considerable area may gradually be cleared of the pest. Certain farmers may be able to turn this to good account, though the dampness of the soil inhabited by the grubs militates against penning. There is no reason, however, why the swine-herd, on farms where such an individual exists, should not keep his charges as much as possible on the breeding ground of the beetle, especially between the months of March and September.

The foregoing suggestions are of a purely tentative nature, but it is hoped that some of the farmers who have suffered heavy losses from the pest will be sufficiently interested to try whichever of the suggestions appears most suited to conditions on their respective farms. It need hardly be added that the writer of these notes would be greatly interested to hear the results of any experiments made.

In conclusion, I desire to acknowledge the assistance of Mr. R. L. Thompson, Assistant Entomologist, in working out the life history of the pest in the laboratory, and in contributing valuable observations on the habits of the insect in the field.

EXPLANATION OF PLATES.

Plate I., Fig. 1.—Maize Beetle (*Heteronychus mashunus*, Pering.); female; enlarged three diameters.

Fig. 2.—Pupa; ventral aspect; enlarged three diameters.

Fig. 3.—Full-grown larva; lateral aspect; enlarged three diameters.

Fig. 4.—Egg, 3-4 days old; enlarged three diameters.

Fig. 5.—Egg, 11-12 days old; enlarged three diameters.

Plate II.—Full explanation included in plate.

Supplementary Note.

Subsequent to submitting the manuscript of the above paper, the writer has received a pamphlet from the United States Department of Agriculture entitled, "The Rough-headed Corn Stalk-Beetle in the Southern States and its Control," by Messrs. W. J. Phillips and Henry Fox, published in October, 1917. The insect to which the above

title refers is (*Ligyrus*) *Euetheola rugiceps, Lec.*, a beetle allied to the Rhodesian pest, and of very similar habits. There is a note concerning its activities in Dr. J. B. Smith's text book, "Economic Entomology," second revised edition, published in 1907, but since that time until the receipt of the present pamphlet, the writer has been unable to find any reference to the pest in literature dealing with applied entomology in America.

The life history and habits of the American pest, whilst essentially similar to the Rhodesian, differ in two marked characteristics. (1) *E. rugiceps* pupates in late summer, emerges as a beetle in about two weeks, and soon hibernates in this stage, whilst *H. mashunus* passes the winter mostly as a larva or grub.* (2) *E. rugiceps* is stated to increase only on waste uncultivated land or on land in sod, whilst *H. mashunus* undoubtedly increases readily both in cultivated and uncultivated soil. Allowing for these differences, it is interesting to note the similarity between the recommendations of the American authors, which are presumably supported by field trials, and the suggestions put forward by the present writer. The following is taken verbatim from the American pamphlet:—

SUMMARY OF CONTROL MEASURES.

(1) Eliminate all old pastures or waste land, especially low, moist areas, and drain such lands thoroughly.

(2) Pasture hogs in waste or pasture lands that cannot be conveniently drained and cropped.

(3) Plant corn early, say about 20th April, for tidewater Virginia, and earlier for more southerly localities.

(4) Give liberal applications of barnyard manure or commercial fertilisers whenever practical.

(5) Employ children or cheap labour to collect and destroy the beetles when a field first shews injury.

(6) Do not allow corn to follow sod if possible to avoid it.

(7) Plow sod land in late summer and early fall in order to destroy the pupæ of the rough-headed corn stalk-beetle.

Substituting "breeding areas" as known in this Territory for "old pastures," "waste land" and "sod land," recommendations 1, 2 and 7 are paralleled in the writer's suggestions. Recommendations 3 and 6 are, of course, not applicable to Rhodesian conditions.

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*It may be noted that the habit of hibernating in the adult stage is common to the various species of injurious "chafer beetles" and "white grubs" in the temperate zone, whilst all the Rhodesian species of these beetles (*Melolonthidæ*) whose life history has been worked out hibernate as grubs. There would appear to be some climatic influence controlling this habit.

Statistics of Crops grown by Europeans in Southern Rhodesia

FOR THE SEASON 1916-17.

By F. Eyles, F.L.S., Statistician.

GENERAL.

The most noticeable feature of the crop statistics for 1917, now presented, is the largely augmented area of land under cultivation, the total now being approximately one quarter of a million acres. The actual figures for the gross acreage under all crops are returned as 249,038, an increase of 46,092 acres, or 22.71 per cent., whereas last year the increase was only 10.65 per cent. This substantial addition to the area under the plough may be taken as a strong proof of the stability and progress of agriculture in Rhodesia, especially when it is remembered that there is no reason to think that the number of farmers in the country has increased during the war.

Without doubt the Imperial offer to purchase all maize produced acted as a stimulus, and we find that, out of the 46,092 acres of new land cultivated; 28,503 were planted to maize as a grain crop and 17,589 to other crops, including maize for ensilage. The proportional increase of land under other crops is, however, much higher than that of maize, being no less than 62.1 per cent., as compared with 16.32 per cent. for maize. This is the first year when such a comparison could be made, for when the collection of statistics was initiated in 1913-14, figures were taken only for maize and tobacco, while in 1914-15 the returns included only a few crops besides maize, whereas in 1915-16, and again this year, 1916-17, every crop of any importance was included.

The premier position of maize as an exportable cash crop is secure, and the steady growth of its production satisfactory. The advance of other crops into favour is, however, even more rapid and remarkable, and of great significance. Although the amount of land under maize shews an actual increase (16.32 per cent.) far greater than ever before recorded, yet the acreage proportional to the total of land under cultivation is less by 4.48 per cent. This means that other crops have advanced relatively in the same degree—4.48 per cent. There has been an absolute increase, but a relative decrease, for maize, while other crops have increased both absolutely and relatively. The following table may make the point clear:—

Season.	All Crops.		Maize.				Other Crops.				Remarks.
	Acres.	Increase, per cent.	Acres.	Per cent. of total.	Increase, positive.	Decrease, relative.	Acres.	Per cent. of total.	Increase, positive.	Increase, relative.	
1913-14	166,895	...	161,268	...	...	...	5,627	...	...	...	Only maize and tobacco recorded
1914-15	183,403	9 89	167,012	91·06	3·56	...	16,391	8·94	...	...	Only a few crops recorded
1915-16	202,946	10·65	174,647	86·05	4·57	...	28,299	13·95	...	...	Nearly all crops recorded
1916-17	249,038	22·71	203,150	81·57	16·32	4·48	45,888	18·43	62·1	4·48	Nearly all crops recorded

These figures, properly interpreted, are full of promise for the future of farming in this country. They indicate that the efforts of this Department to encourage variety in the crop system have not been wasted, that the practice of concentrating on a single cash crop is being gradually abandoned, and that the era of rotational farming has dawned. For the first time in our history we are able to record that a quarter of a million acres of land are under the plough, and that the system of agriculture has reached a stage when it may be said that, by the diversity of cultural operations, land, the most stable of all national assets, is now receiving a reasonable amount of scientific and intelligent care.

As a natural corollary from the above statement, and in keeping with the general improvement in farm practice, it might be anticipated that the amount of ground devoted to cattle-feeding crops, which are kept on the farm to its enrichment, will also be increased. This is found to be actually the case. Taking the six leading crops of this class—cattle melons, pumpkins, teff grass, millets, Napier fodder and velvet bean hay—we find that in 1916 these occupied 6,776 acres, and 12,764 acres in 1917, or nearly double the acreage. In addition, there were 9,803 acres under maize as an ensilage crop, and 24,103 tons of veld hay cut, while the number of silo pits and stacks increased from 512 to 694. All this indicates that the distinction between pastoral and agricultural farming tends to disappear. The stock owner finds it pays him to raise crops for the sake of his herds, and the agriculturist finds it profitable to keep stock for the sake of his land. Mixed farming in its best sense is becoming more general. The bare figures of statistics in their columns year by year shew a steady swelling as to quantities, while an analysis of their relative changes proves an equally steady improvement in the quality of Rhodesian farming.

Tables I., II. and III., at the end of this article, set out the gross acreage of cultivated land in three aspects, viz.: (1) in relation to districts, giving the percentage of increase or decrease for each district; (2) in relation to crops, shewing the amount of land under each, and the average acre-yields; and (3) in relation to classes of crop, from which it will be seen that cereals occupy 87.76 per cent., succulents and fodders taken together 11.37 per cent., and sundry crops 0.87 per cent. of the grand total.

It should be noted that in this discussion the land under citrus and other orchards has been ignored. Taking citrus trees as averaging 70 to the acre, it will be found that a further 2,134 acres are added to the total, bringing the gross amount of land under cultivation to 251,172 acres. Also, if a full measure of the extent of agricultural activities is to be obtained, mention must be made of the large quantity of veld hay cut and stacked.

CEREALS.

Maize.—The amount of land under maize this year exceeds the grand total for all crops last year, while the harvest constitutes a record, the highest previous figure being 914,926 bags in 1914-15. A preliminary estimate of this crop, published by the Department of Agriculture in April, 1917, placed the probable harvest at 950,000 bags reaped from

203,902 acres. Subsequently, however, additional late returns came in from growers, bringing the acreage, as measured at planting time, up to 208,657 acres, while reports, furnished by the courtesy of farmers, officials and others, indicated that crop prospects at the beginning of harvest were, in most districts, somewhat more favourable than had been expected earlier in the year. Based on these data, an amended estimate was published in June, giving the probable crop for the year as 1,010,000 bags.

The actual figures now returned are 938,130 bags from 203,150 acres, being less than the first estimate by 1.25 per cent. in the crop and 0.37 in the acreage. It will be noted that the farmers' measurements of acreage were, as usual, greater at time of planting than at time of reaping. Compared with the second estimate, the harvest reaped is 7.12 per cent. less, a somewhat large margin of error. The explanation is found in the fact that the appearance of the crop was deceptive, and right up to the time when harvest had already commenced growers were under the impression that they would reap more than they did. It was only when the husking and shelling of the cobs were well advanced that it was generally realised that results would be disappointing. This was probably due to the peculiar incidence of rain and other climatic conditions during the growing season, in consequence of which the maize was irregularly pollenised, so that a high proportion of good looking cobs, when husked, proved to be imperfect and carried little grain.

The following figures shew the position and progress of maize production :—

Season.	Acres.	Bags.	Average Yield.
1913-14 ...	161,268	634,133	3·93
1914-15 ...	167,012	914,926	5·47
1915-16 ...	174,647	680,285	3·88
1916-17 ...	203,150	938,130	4·62

Under the circumstances, the acre-yield of 4.62 bags for the whole country may be considered satisfactory. For the chief grain districts the acre-yields were as follows :—Mazoe, 7.9 ; Lomagundi, 5.2 ; Salisbury, 4.9 ; and Hartley, 2.4 ; Lomagundi supplanting Salisbury in the second place, which it held last year.

Wheat.—In February, 1917, a short note appeared in the *Agricultural Journal* urging upon farmers the importance of growing more wheat, because the Imperial demand was great and the South African supply likely to be short. Attention was drawn to the high prices ruling, and it was pointed out that an increase of wheat production would be profitable to the grower and beneficial to the country. Again in April two articles on wheat growing were published, one by Mr. C. Wilmot and one by the Assistant Agriculturist, in which cultural directions were given, and announcements were made of the Government's

offer to assist in the matter of threshers and winnowers, and of reductions in railway rates on wheat. In the same *Journal* particulars were given of a prize offered by Messrs. A. F. Philip & Co. to be presented to the largest grower of wheat in the Territory.

These various efforts to stimulate wheat production have not been without effect, for the returns shew that wheat this year ranks second among the cereals, with 4,655 acres to its credit, or an increase of 127 per cent. Of this, 1,534 acres produced 3,031 bags as a summer crop, and 3,121 acres were put down to winter wheat. If the average winter production is taken at 3 bags per acre, we get a local production of 12,394 bags. The bag being 200 lbs. net, this is equal to 2,478,800 lbs. locally produced of the most important of all food materials for Europeans. Although a step in the right direction, we still have a long way to go, for in 1916 Rhodesia imported 7,379,692 lbs. of wheaten flour and meal.

Ground Nuts.—These continue to hold a high place in the list of crops, 3,830 acres being planted, an increase of 787 acres for the season, with a yield per acre of 6.3 bags or a bag less than last year.

Beans.—A good deal of attention is being given to the bean crop at present, as hopes are entertained that an export trade may be opened up. It will be noted with interest that this is one of the few crops which shew an increased yield this season—see Table II. It should be observed, however, that the average acre-yield of any crop for the whole country is no criterion whatever as to what that crop will produce in favourable conditions. Maize, beans and other crops are frequently raised in districts unsuitable to them, for stock feeding or rotational purposes, and without consideration as cash crops. The yields in such cases are often very low, with a depressing effect on the acre-yield as a whole. For instance, though the average for beans for the Territory is just under 2 bags per acre, many farmers average 4 bags year in and year out.

Other Cereals.—The remaining crops in this class are kaffir-corn, sunflower, buckwheat, dhal, rye and linseed. With the exception of sunflower seed, none of them seems destined to occupy an important place in our agricultural economy. The area under buckwheat, dhal and rye, although slightly increased, is still insignificant. Kaffir-corn, sunflower and linseed occupy less land than last season, and the acre-yield of sunflower seed fell from 5.6 bags to 3.3 bags. The reduction in yield in sunflower seed was probably due to climatic conditions in a season when other crops suffered in the same manner, and, considering the possibilities of this oil seed as a commodity for export, it is probable that, if a market is opened up, the crop will come into favour again.

SUCCULENTS.

Crops under this heading (see Table III.) were grown upon 21,892 acres, and, with the exception of 2,608 acres under potatoes, it may be said that all this land was devoted to raising cattle food, most of which was consumed on the farms where grown. A reference to the main table will shew that 47,426 tons of succulents were produced for this purpose, omitting sweet potatoes, the returns for which are unreliable in respect to acre-yield.

Sweet potatoes and mangels are grown on a smaller scale than previously. It seems remarkable that sweet potatoes should go out of favour, seeing what heavy yields can be obtained, and remembering the great value of this root for stock feeding in general and for milk cows in particular.

The acreage of maize for silage is recorded for the first time. All the other crops in this class shew substantial increases, the most remarkable of which is the rapid advance of cattle melons, the acreage for which has more than doubled itself in one season, so that this crop now comes next to maize in respect to the amount of land given to it. The reason doubtless is that melons flourish in a dry season, while they give a greater yield and are better keepers than pumpkins.

Potatoes.—The acreage under potatoes increased by 48.4 per cent., namely, from 1,757 to 2,608 acres, and the summer crop by 39.8 per cent., namely, from 26,290 to 36,760 bags. No estimate of the winter crop was called for.

It is convenient in this place to note that the number of silo pits and stacks has risen from 512 to 694, an increase of 35.5 per cent.

FODDERS.

In this class the most noteworthy feature is the steady advance of two crops introduced and recommended to the farmers by the Agricultural Department. One, Napier fodder, is a perennial native of the country, tested and proved at the experiment stations, and now occupies third place among the fodder crops and fourteenth place in the list of all crops. In 1916, 479 acres were planted, and in 1917, 753 acres, an increase of 57.2 per cent. The other, teff grass, is an exotic annual. It now stands first for acreage in the list of fodders and ninth in the list of all crops. The area under this crop was 2,014, compared with 1,746 acres in 1916, an increase of 15.3 per cent.

The other crops in this class are oat hay, millets, velvet bean hay, barley fodder, cowpea hay and lucerne, none of which call for special remark. The acreages of these, and all other crops not given in the main statement, may be seen in Tables II. and III. The total weight reaped of all fodder crops, returned and estimated, would be about 8,000 tons. If we add together the weights of succulents, fodders and veld hay, it will be found that about 80,000 tons of cattle feed was raised for use on the farms, to which must be added an unknown quantity of cereals, such as maize, ground nuts, beans, etc., which were used as concentrates for stock feeding.

SUNDRY CROPS.

Under this head we include only tobacco and onions. The latter may be regarded as little more than a garden truck crop, and stands near the bottom on the list of all crops.

Tobacco.—Although here incidentally treated last of all field crops, tobacco ranks high in importance as a valuable export crop, and its position and progress call for consideration. Tobacco planting received a sudden and serious set-back in 1915, for reasons commercial rather than agricultural. Following on the debacle of 1915, the planters

united in a co-operative society to guard and advance the interests of the industry. Recovery immediately began, and a glance at the following table will shew that it has continued to be appreciable, and promises to be steady, so that there is good reason to hope that the industry will regain its old position as regards value for export, while being at the same time on a more stable basis as a commercial concern.

TOBACCO.

Year.	Acres.	Yield, lbs.	Per cent. Increase in Total Yield.	Acre Yield, lbs.
1914 ...	5,627	3,061,750	...	544·11
1915 ...	1,370	426,423	...	309·71
1916 ...	1,310	637,261	49·4	486·46
1917 ...	1,995	910,684	42·9	456·48

The acre-yield is not of such importance as the maintenance of quality and the securing of proper curing and preparation for the market, which points are not likely to be neglected by the planters. It may be assumed that the increased output is good, marketable leaf, while the increase of acreage planted this year is 52.3 per cent., which indicates a restoration of confidence, and augurs well for the future of this valuable industry.

CITRUS ORCHARDS.

The subjoined table gives the position as regards numbers of citrus trees of all kinds:—

	Trees Bearing.	Trees not Bearing.	Totals.
Oranges	37,799	78,484	116,283
Lemons	8,300	12,326	20,626
Limes	436	295	731
Naartjes	4,115	1,837	5,952
Grape Fruit	3,267	2,324	5,591
Pampelmoes	166	80	246
Totals ...	54,083	95,346	149,429

The number of orange trees has increased from 86,967 to 116,283. Other citrus trees appear to have decreased, the total returned in 1916

being 42,847 and in 1917 33,146, but these figures cannot possibly reflect the true position. The explanation probably is that, as we have now called for a detailed count of all trees by kinds for the first time, more care was taken in filling the forms than when we asked for the total of all citrus other than oranges. It will be safer, therefore, to take the figure for 1917 as approximately accurate, and base future comparisons on it.

The returns gave 22,878 orange trees and 8,618 other trees as being under irrigation. It is probable, however, that a higher proportion of trees received irrigation water, for quite a large number of planters failed to answer the question respecting irrigation of citrus, and we have treated as irrigated only those returns definitely stating the fact.

CONCLUSION.

The recognition by farmers of the utility of statistical work in the interest of the industry is now general, and there is every sign that they wish to assist as much as possible. I will, therefore, offer a few remarks on suggestions received and the most common errors made in filling return forms.

Negative Returns.—Some farmers, who have no crops for the year, neglect to return the forms. It should be remembered that negative returns are as essential as positive ones, and until they come in it is impossible for this office to make up the totals. Farmers who are at present ranchers only seem to think it is giving them unnecessary trouble to ask for crop returns, but they should bear in mind that the fact they grew no crops one year is no proof they will not do so next year. A man who has land and cattle may any time decide to plough and plant, if only for stock feed, so that we are bound to ask for a crop return.

Reserve Column.—The column for recording the amount of any crop kept for home use and seed is far too frequently left blank. This figure is not so important as that for yield, but it should not be neglected.

Citrus Irrigation.—The number who failed to answer the question on this point was large, and in all such cases we have had to treat their orchards as "not irrigated."

Acres.—A few forms were received with the column for acres under crop not filled in. The number was not sufficient to interfere materially with the total figures, but a little care on this point will assist towards closer accuracy.

Other Errors.—Errors of minor importance, because infrequent, may be mentioned. Yield only given, without acres or reserve. Reserve only given, without acres or yield. Acres only given, without yield. Silo pits not returned, though considerable amount of maize for ensilage was grown.

Attention is drawn to these points, not in any carping spirit, but because it is felt that farmers desire to co-operate with the Department to make the statistics of the industry as complete and reliable as possible.

Several valuable suggestions for improving the return forms were received, all of which were welcome and are being carefully considered.

Table I.

Districts in order of Acreage of Cultivated Land.

District.	1914-15.		1915-16.		1916-17.			
	Acres.	Sequence.	Acres.	Sequence.	Acres.	Sequence.	Per cent. difference.	
							Increase.	Decrease.
Mazoe ...	41,524	1	46,282	1	57,622	1	24·50	...
Salisbury ...	34,745	2	42,332	2	45,939	2	8·52	...
Hartley ...	21,641	3	21,269	3	25,171	3	18·34	...
Lomagundi...	12,869	4	12,272	4	17,392	4	41·72	...
Gwelo ...	8,656	5	11,939	5	17,072	5	43·00	...
Makoni ...	5,600	8	8,335	6	9,557	6	14·66	...
Insiza ...	4,932	9	6,017	8	8,584	7	42·66	...
Marandellas	7,141	6	7,106	7	8,342	8	17·39	...
Bulalima-Mangwe	3,838	12	4,430	10	6,776	9	52·95	...
Charter ...	3,601	13	4,123	12	5,967	10	44·72	...
Umtali ...	4,852	10	4,986	9	5,093	11	2·14	...
Bubi ...	2,996	15	3,763	13	5,070	12	34·73	...
Chilimanzi ...	2,630	17	3,561	14	4,885	13	37·18	...
Nyama-ndhlovu	3,490	14	4,154	11	4,644	14	11·74	...
Victoria ...	2,711	16	2,569	17	4,362	15	70·00	...
Bulawayo ...	2,095	18	2,737	16	3,921	16	43·26	...
Matobo ...	939	24	2,241	18	3,246	17	44·84	...
Melsetter ...	1,894	20	2,088	20	2,833	18	35·68	...
Selukwe ...	6,370	7	2,123	19	2,722	19	28·21	...
Mrewa ...	*1,918	19	1,687	22	2,127	20	26·08	...
Umzingwane	3,929	11	2,758	15	1,821	21	...	33·97
Gutu ...	†	†	1,142	23	1,505	22	31·76	...
Wankie ...	1,052	23	1,874	21	1,150	23	...	38·64
Ndanga ...	‡1,537	22	797	25	1,055	24	32·37	...
Gwanda ...	1,560	21	1,055	24	694	25	...	34·22
Inyanga ...	286	26	600	27	529	26	...	11·84
Belingwe ...	597	25	611	26	516	27	...	15·55
Darwin ...	§	§	95	28	399	28	320·00	...
Mtoko ...	§	§	...	30	34	29	...	...
Chibi ...	†	†	...	29	10	30	...	...
	183,403	...	202,946	...	249,038	...	22·71	...

* Includes Darwin and Mtoko.
‡ Includes Gutu and Chibi.
† See Ndanga.
§ See Mrewa.

TABLE II.

Crops in order of Acreage, 1917.

	Acres.	Acre Yield.		
		1917.	1916.	1915.
Maize for Grain	203,150	4·62 bags	3·88	5·47
Maize for Ensilage	9,803	2 tons	...	...
Cattle Melons	5,486	3·67 tons	...	...
Wheat	4,655	2·0 bags*	2·9†	3·6†
Ground Nuts	3,830	6·3 bags	7·36	6·87
Pumpkins	3,361	2·18 tons	...	...
Beans	2,949	1·9 bags	1·4	...
Potatoes	2,608	14·0 bags*	20·4†	24·4†
Teff Grass	2,014	0·87 ton	...	...
Tobacco	1,995	456 lbs.	486	309
Oats	1,799	1·5 tons*	1·0†	1·4†
Kaffir Corn	1,657	1·8 bags	1·8	1·8
Sunflower	1,018	3·3 bags	5·6	5·6
Napier's Fodder	753	...	...	...
Millets	741	0·76 ton	...	...
Sweet Potatoes	552	...	...	...
Buckwheat	527	2·6 bags	1·6	...
Dhal	482	...	...	...
Velvet Bean	409	...	...	...
Barley Fodder	336	...	...	...
Cowpea Hay	269	...	...	...
Rye	237	...	...	...
Onions	156	26·5 bags	26·0	...
Lucerne	116	...	...	...
Mangels	82	2·5 tons	...	...
Linseed	53	0·83 bag	0·6	...
	249,038			

* Summer crop only.
† Summer and winter crops.

Table III.

Acreage in relation to Class of Crop.

		Acres.	Acres.
Cereals ...	Maize for Grain ...	203,150	
	Wheat	4,655	
	Ground Nuts ...	3,830	
	Beans	2,949	
	Kaffir Corn ...	1,657	
	Sunflower	1,018	
	Buckwheat ...	527	
	Dhal	482	
	Rye	237	
	Linseed	53	
			218,558
Succulents ...	Maize for Silage ...	9,803	
	Cattle Melons ...	5,486	
	Pumpkins	3,361	
	Potatoes	2,608	
	Sweet Potatoes ...	552	
	Mangels	82	
			21,892
Fodders ...	Teff Grass	2,014	
	Oat Hay	1,799	
	Napier's Fodder ...	753	
	Millets (Manna, etc.)	741	
	Velvet Bean Hay ...	409	
	Barley Fodder ...	336	
	Cowpea Hay ...	269	
	Lucerne	116	
			6,437
Various ...	Tobacco	1,995	
	Onions	156	
			2,151
			249,038

Imperial Purchase of Cattle.

The recently completed arrangements for the purchase of Rhodesian cattle in large numbers by the Imperial Government is a matter of first-class importance to local cattle owners, and, taken in conjunction with increased facilities for the export of stock to the Union, should mean a very appreciable improvement in the prospects of the ranching industry.

The responsibility and full control of this business is in the hands of the Controller of the Defence Force, Colonel Masterman, and particulars of the arrangements made for the purchase and despatch of cattle have already been made known through the public press. Very briefly stated, they are as follows:—

When cattle have been offered for sale, the purchase board visits the farm where they are as soon as possible. If the cattle are considered suitable, an offer is made, based on estimated dead weight. In the event of a bargain being struck, an agreement is signed, one-quarter of the price paid at once, and the seller undertakes to brand the cattle, take reasonable care of them for a period not exceeding three months, to dip them weekly, and finally dip them 48 hours before entraining. Within the three months mentioned, which is a maximum, and as a matter of fact the cattle are removed as quickly as possible after purchase, the Controller notifies the seller to arrange for the despatch of the cattle, and the seller has to see to details of entraining, etc. The payment of the balance of the purchase money is then made by the Controller on production of the receipted railway consignment note.

The destruction of the Odzi bridge, temporarily preventing the passage of trains, may have caused farmers to fear an interference with the arrangements and a stoppage of purchase. We are authorised to state, however, that buying will go full speed ahead as soon as weather conditions permit the Controller to get about the country to inspect the herds offered.

Immediately through traffic to Umtali was stopped, arrangements were made to shift the receiving depôt from Feruka to the west side of the Odzi River, and this was accomplished within a few days. The depôt is now at Odzi, on the farm Wallacedale, where cattle will be received and held until the river can be crossed, when they will be driven to Raheen depôt.

Farmers having slaughter cattle not yet considered fit for sale, but which will be suitable for the market later, should inform the Controller as to number and probable date when they will be ready, so that the Defence Department may be in a position to advise the Imperial authorities as to the numbers which will be available in a given period.

Steamers have been cancelled for the time being, but will be arranged for as soon as the Mashonaland-Beira line can move the cattle.

Special arrangements have been made through the Beira Boating Company for the handling and shipping of the cattle, which are run between fenced lines down the beach to lighters, which carry them to the steamers, where they are slung on board.

Colonel Masterman will be glad to hear from farmers who can make and bale hay, as he will require large quantities for feeding on the steamers. He is prepared to pay from 37s. 6d. to 40s. per ton for well-baled (3-strand) hay at any station or siding.

Mysterious Outbreak of Disease amongst Cattle.

By H. S. Woods, M.R.C.V.S.

A mysterious outbreak amongst cattle owned by white settlers in the Mazabuka district of North-Western Rhodesia occurred in the middle of September, and carried on for about six weeks, at intervals, with various degrees of mortality. The sudden incidence of the rather alarming symptoms, with the equally quick recovery with absolutely no signs of ill-health or loss of condition, made the outbreak a very difficult one to deal with in this country of long distances and difficulties of transport, and it is thought that an article such as this will provoke an interesting discussion amongst farmers who have had similar outbreaks and have been unable to find the cause, and tend, with the combined knowledge so acquired, to bring us nearer to a definite diagnosis and cure.

The Veterinary Department was called in by wire from a farmer who had 105 head of trek oxen which suddenly went mad, but on the arrival on the farm of two Government veterinary officers the active symptoms had all disappeared, and the cattle were grazing peacefully. Had it not been for the fact that there were 10 carcases to be buried, one would have felt inclined to doubt that anything had been wrong at all. Other outbreaks occurred on the farm at intervals of a week and three weeks, and also on neighbouring farms within a radius of about 15 miles, but although there were other farms in and around this area, no outbreaks occurred on them. All cattle except young calves were

affected, and condition appeared to make no difference, herds in good condition being affected equally with those in poor condition. The outbreak always occurred in one special herd, and nearly all the cattle in that herd shewed symptoms, while another herd which might be grazing within half a mile from the one affected, on the same type of veld, would shew no symptoms at that particular time. No cattle which had shewn symptoms once were ever affected again, and there appeared to be no reason why one herd only should be affected.

On all these farms the usual types of country were found, viz., sandy hills with rock outcrops, bush and open flats, and no one type of grazing appeared to be more suspicious than the other, as cattle had been grazing over them for years. On one farm the cattle were all watered at the same pool in a river, whilst the pool held out, and then from a concrete trough filled from a deep well of very good water. On the other farms there are running rivers which are quite above suspicion. In every case, all the cattle on the farm had been watered at the same place, and only one herd at a time was affected, and this fact eliminates the water as a probable cause of the symptoms.

Symptoms.—The outbreaks occurred whilst the cattle were grazing, or just after drinking. The number of cattle in a herd to be affected varies from one or two to the whole herd, but as a rule the majority shew symptoms. These symptoms are very typical, and vary only in intensity, the acute cases being either dead in a few minutes, or having numerous fits, in any one of which death may occur, though the less acute cases may last up to 24 hours, when the animals usually recover. The onset is very sudden, especially after drinking. A bad case will shew acute nervous excitement, rush about blindly, and then suddenly circle and drop dead, as if shot. Others fall down or throw themselves backwards into a fit resembling an epileptic fit, and, after struggling on the ground for a time, die. Others have several fits in quick succession, and die in a later one. During the fit, the animal lies on the ground struggling and kicking; breathing is very quick, and the pulse affected. Eyes are wild and staring, and the membranes are drawn over the eye-balls. The muscles are tightly contracted as in lock-jaw, but if fluid is introduced carefully into the mouth, it is swallowed without trouble. There is champing of the jaws and dribbling of saliva, increased in amount during the fits. Some animals affected have rushed into the bush, and later have been found dead. All variations and degrees of the above symptoms are shewn. The more protracted cases last up to 24 hours, and the chief symptoms are excessive nervous excitement, lack of co-ordination and staggering gait. The animal when first moved has a very high action, very suggestive of stringhalt all round. The beast does not feed, but the dung is passed normally, and though normal in consistence, is light in colour, and mixed, rather than coated, with mucus.

"Post-Mortem" Appearances.—Unfortunately we have not been able to conduct a *post-mortem* examination, as although a Government veterinary officer waited on the farm for periods up to a week, no outbreaks occurred, and, owing to the time of the year, the great heat had caused putrefaction in reported cases before the arrival of the veterinary officer. However, the different farmers had opened the carcases. The

following is a description given by one of them:—Lungs very engorged with blood, and great inflammation of the second stomach. Intestines practically empty except for an almost odourless fluid. A large clot of blood about the size of a walnut was found at the base of the brain in all cases of death in one of the later outbreaks.

Mortality.—The mortality on different farms varied a great deal —on one farm being only about 2 per cent., while on another it was as high as 22 per cent. The number of cattle in a herd affected also varied considerably, but the size of the herd apparently made no difference, as in some large herds nearly all were affected, and the same held good for smaller herds of 50 to 70 head.

Probable Causes.—The cause of the outbreak remains obscure, although all evidence goes to prove that a poison of some kind produces the symptoms. Blood and other smears were taken and stained in various ways, but all gave negative results after careful examination. Poisonous plants, which caused somewhat similar outbreaks in Southern Rhodesia, were suspected and searched for in vain, although samples had been obtained from Southern Rhodesia to aid the search. Mkowsan was suspected, but this plant cannot be found in the locality. Klimop has been thoroughly searched for, as also have various poisonous plants known in the south. Specimens of suspicious plants were sent to the Mycologist, Pretoria, who kindly examined them carefully, but without result. Ingesta were subjected to analysis, also with negative results. Chemical poisons, particularly arsenic, were eliminated, and it was found the deeper the search for the cause became, the deeper the mystery. Natives, who had grazed cattle on one of the farms for years before the influx of the white settlers, disclaimed all knowledge of the cause, and denied ever having had a similar outbreak. However, in two other kraals in the neighbourhood, the natives said that they had had, in the past, similar outbreaks, and at one place at a certain time of the year, the early spring, they moved all their cattle away annually because of the deaths. The last two rainy seasons have been poor, and the rains were particularly late this year, the country as a result being very dried up, and it is possible that cattle would eat any green plants which come up before the grass more than in other years, owing to the lack of feed.

Grazing on some of the farms was poor, and it is possible that soil may have been eaten with the roots, and caused the symptoms, although no excess of dirt was found in the stomach. Pod-bearing trees came under suspicion, but only the common trees known to all farmers as good cattle feed at that time of the year were found. Contact of susceptible cattle with affected herds had no result.

The outbreak was at first considered something entirely new, but enquiries after a time elicited the information that in former years in other districts farmers had cattle affected with the same symptoms of madness (as they put it), with the loss of one or two head, and then no recurrence of the outbreak. The symptoms resemble those of heat apoplexy, but as some of the beasts were found dead in the kraals in the mornings and others were taken ill within a few hours of leaving the kraals before the heat of the day, and only one herd out of many was affected, the sun as a cause had to be ruled out.

Management of Dipping Tanks.

By J. M. Sinclair, Chief Veterinary Surgeon.

In a paper entitled "Notes relating to Arsenical Dipping Fluids," by Mr. A. G. Holborow, F.I.C., Assistant Agricultural Chemist, which appeared in the December, 1915, issue of the *Journal*, it is stated that "it should be an easy matter, knowing the volume of liquid in the tank and the exact strength of it, to rectify any deviation by adding water only, or dip, as the case may be, and bring the dipping fluid to any desired strength." The writer agrees entirely with this view, but his experience shews that many owners and managers of tanks find a considerable difficulty in doing so. In some cases the reason is that the capacity of the tank inch by inch is not known, or, if known, is not made use of in calculating the quantity of water or dip required to bring the liquid in the tank to the proper strength. In other cases, the quantities are calculated in a haphazard or crude manner, with the result that the strength may be so increased as to cause damage to the cattle, or so diminished as to be ineffective. The tendency in the majority of cases is in the latter direction, probably because the persons concerned, not being quite sure of their quantities, prefer to err on the side of safety.

The following notes on the management of the dipping solution and dipping tanks generally will, it is hoped, be of some assistance to stock owners.

1. At the first filling the water should be measured into the tank by a 200 gallon or other convenient measure.

2. From the 3 feet 6 inches level the volume, inch by inch, should be carefully recorded and marked on the wall of the tank, or preferably on a measuring rod, which can be obtained at a small cost.

3. The level should be recorded after each dipping and again before the following one.

4. Any decrease due to evaporation should be replaced by water only.

5. Any increase due to rain or flood water should be made up to standard strength by the addition of the corresponding quantity of dip.

6. When a sample is taken for analysis the quantity of solution in the tank at the time should be accurately estimated, otherwise it is impossible to rectify any excess or diminution of strength shewn by such analysis.

Residence of the Curator, Matopo Estate. Photo by Bertram Woods.

Rhodes Matopo Dam. Photo by Bertram Woods.

7. The following example is given of correcting the strength of the solution in the tank on receipt of the result of the analysis:—

(a) capacity of tank at proper dipping level—3,000 gals.;

(b) prescribed strength of dip used—say, 1 to 150 gals. of water;

(c) quantity of solution in tank at date sample was taken—say, 2,400 gals.;

(d) assume analysis shews strength—1 in 200;

(e) then the 2,400 gallons in tank contain 12 gallons of dip only, instead of 16 gallons; therefore, 4 gallons of dip must be added to bring the solution up to proper strength;

(f) there remain the 600 gallons of water required to bring the volume in tank up to the proper dipping level; this requires another 4 gallons of dip;

(g) the total quantity of dip, therefore, which is required to rectify the diminished strength of the solution in the tank, and provide for the 600 gallons of additional water added to the tank, is 8 gallons.

8. Where necessary, the tank should be protected by drains, to prevent the dip being flooded out on to the surrounding veld.

9. When not in use, the entrance and exit of kraals and draining pens should be properly secured.

10. The draining pens should be so constructed that dip cannot collect in them.

11. The drums, whether closed or not, containing the concentrated dip should be kept under lock and key.

12. When emptied, the drums should be immediately and thoroughly washed, and the washings placed in the tank or buried.

13. Where kraals are used in addition to draining pens, in order to allow cattle to drip and dry completely, cattle should not be allowed into them until any water which may have collected in pools has been dispersed.

In forwarding samples of dipping solutions for analysis, the greatest care should be taken to ensure that the bottles in which they are forwarded, and the utensils used for filling the bottles, are absolutely free from extraneous arsenic.

Hides, Skins and Leather Manufacture.

[Reproduced by permission from the "South African Journal of Industries," October, 1917.]

By Ernest R. Swale, Manager, Messrs. J. W. Jagger & Co., Tanners, Capetown.

One of the earliest trades established in the world was probably that dealing with hides, skins and leather.

The skins of the larger animals, such as cattle, horses, elephants, whales, etc., are called hides; those of sheep, goats, deer, pigs, seals, etc., are called skins.

One very important point is that we are dealing with what is perhaps the largest bye-product in the world. In no single case are the animals bred for the sake of their skins alone. Used as they are for their food-producing properties, their services as draught animals, or for their wool or fur, generally speaking the skins and hides receive very little care and attention. The small monetary value attached to the hide, even at present high prices, in proportion to the value of the carcase, no doubt helps this neglectful attitude.

Hides and skins are now drawn from all quarters of the globe to the great leather-producing countries. The chief sources of supply are the domesticated animals, such as cattle, sheep and goats. The principal centres of supply are the great cattle ranches of South America, and the sheep farms of Australia and South Africa.

Hides are prepared and placed on the markets in the following classes:—

(a) *Market or Blood Hides.*—These are freshly slaughtered hides, drained and offered for sale, and naturally cannot be kept in this condition long.

(b) *Wet Salt Hides.*—These are cured for storage by plunging into a brine bath, or heavily salting in a pile.

(c) *Dry Salt Hides.*—These are preserved as in the latter case and then dried out.

(d) *Sun-dry or Flint Hides.*—These are cured by being dried in the air without the use of any preservative.

(e) *Arsenicated Hides.*—From the East we get these hides, which are cured by plastering the flesh side with alkali earths and drying out.

Sheep skins and "goats" are usually offered in either the dry salt or sun-dry condition.

So great has become the demand and so scarce the supply that all over the world, even in the most out-of-way places, men are busily engaged in gathering together these stores. From this the fact arises that it is not the local demand, but the world demand, that determines the price.

Hides and skins are subject to certain faults generally attributable to ignorance or carelessness on the part of the seller. The greatest of these is bad flaying. This fault, which is especially noticeable in South African hides, is caused by the careless use of the knife when removing the hide from the carcase. It is very rare to see a South African hide perfectly free from one or more knife cuts. This could be obviated if the men employed in flaying were taught to be more careful with the knife and trained to pull the hide off the carcase. In France a wooden instrument is often used, and the hide beaten off rather than cut from the carcase. Another feature of the South African hides is the bad "pattern," as the tanners call it, that is the outline of the hide or skin.

Blood hides often suffer from not being properly cooled off after flaying, and being offered for sale saturated with blood and water picked up from the abattoir floors. Wet salt hides suffer from the inferior quality of salt used, or from the excessive amount of salt and often sand applied in order to increase their weight. It is the common practice in this country to preserve the hide by plunging it into a pit of salt and water. In my opinion this does not in any way improve the quality of the hide. I understand the pit is used over and over again, and thus the brine becomes saturated with dirt, blood and waste tissue; it then ceases to have any preserving properties, and may set up bacterial action in the hide, especially in warm weather, leading to loss of weight and damaged hides. These pits, if used, ought to be cleaned out at frequent intervals. Even then it is doubtful if hides preserved in this way are equal to those carefully salted with clean salt and piled in a level pile. Soaking as they often do for some considerable period in the brine, they become thoroughly impregnated with the salt, the fibre is attacked and the tanner has the greatest difficulty in removing the last trace of salt, which, if left in, will give him thin, poor leather.

Sun-dry hides are often badly burnt owing to being exposed to the direct rays of the sun whilst drying. This causes the outside tissue to dry, but the inside gelatine is liquefied. This defect is rarely discovered until the tanner commences to soak back the hide, when these damaged parts crumble away. If dry hides are to be kept a long time, care should be taken to prevent moth attacking them.

In view of these evils, and in order to promote the interests of South Africa, the following points are urgently recommended to producers of the raw material in preparing hides and skins for the market:—

(1) *Immediately* after the death of the animal the hide or skin should be *carefully* taken off.

(2) The fleshy or fatty portions still adhering to the skin should be detached down to the smallest particles.

(3) The hide should, without the least delay, be hung up in a very airy place, one not exposed to dampness, with the hair side inwards, so that a draught of air may play upon the entire length of the flesh side of the hide.

(4) In order to prevent the hide from shrinking, the head and tail ends should be stretched out and nailed to the pole.

(5) The legs should be spread with skewers on each side.

(6) If salted, only fresh clean salt, free from iron or saltpetre, should be used.

(7) Salt should be spread liberally and freely over the whole hide, special attention being given to the shanks and heads.

(8) Hides should be salted and piled rather than plunged in brine.

(9) Lastly, the flaying of hides should not be entrusted to inexperienced persons, for unless a certain dexterity is brought into operation, the value of the skin will be considerably lessened.

Certain defects are noticeable in South African hides caused by the conditions under which cattle are reared.

The chief of these is branding. The owner, in order to distinguish his cattle, usually burns his brand upon them. This causes an unsightly scar, usually on the best part of the hide. If some method could be adopted which, whilst identifying the animal, would avoid these disfiguring marks, the value of the hide would be greatly increased. If the hides must be branded, a less valuable place should be marked. The other faults are horn marks, barbed wire scratches, and damage caused by ticks. The latter is now being gradually eradicated by the dipping regulations.

Hides and skins generally come into the market through the agency either of the produce merchants or the big meat selling companies. The former usually have their collectors buying round the country, or direct from the butchers at the abattoirs. They are then either exported direct for sale at the chief auction marts of the world, as London and New York, or sold locally to exporting agencies. South African tanners usually get their supplies by buying what they require from one of these large holders. One noticeable feature is that the hides are usually sold as a lot in fair merchantable condition, and generally comprise all weights and all defects, such as cuts and brands. In England the purchase and sale are much more scientifically handled. There are large hide markets in the chief centres, as Liverpool, London, Manchester, Nottingham, Derby and Leeds. These markets have their collectors buying their supplies from the districts they work in. The hides are then sorted and classified according to their weight, quality and selection. These weights are very finely graded, and the classification is very carefully done. They are then offered at open auction, when the tanners or their agents bid for the class and selection they require. The great advantage of this method is that each buyer can get the exact

class of hide or skin to suit the work he is engaged upon, and be certain that every one will be suitable for the purpose he buys it for.

Leather is the product obtained by the process of tanning and currying the hides and skins of animals, and possesses certain characteristic physical properties. It must be manageable and elastic after drying, as well as imputrescent. These properties are physical, and vary with the kind of hide or skin employed, and the modifications which it undergoes. Chemically considered, leather proper, whatever its kind, while not accurately speaking a chemical combination, is a colloidal compound of the tannin and gelatine, possessing the all-desirable requisites of durability, pliability, inalterability, insolubility in water, and a great power of resistance to the action of chemical reagents. When mineral substances are used in making leather, the result is a compound of gelatine, with the base formed, and is more or less indestructible according to the nature of the material and the circumstances under which the combination takes place.

Classes of Leather.

The raw material used in all leather manufacture is the hide or skin of any animal. According to its nature it is manufactured into the various kinds of leather. The more the animal is improved by breeding as regards its food or wool producing properties, the more its hide or skin deteriorates as regards its leather producing properties. It therefore follows that the best hides and skins for the tanner are those from the wilder or less highly bred animals.

Heavy hides are converted into sole, belting and harness leather; medium and light hides into upper leather, bag leather and upholstery leather. Calf-skins are manufactured into upper leather, and are especially good for book-binding leather. This leather, notwithstanding its thinness, excels in strength, flexibility and texture.

Sheep-skins are used for the lower grade book-binding and upper leathers, whips, linings and bindings for boots and hats, gloves, clothing, and sometimes bags, etc. The various breeds of sheep, on account of their vast numbers and their numerous applications, rank next to oxen in value as sources of leather. Tanned with bark, their skins are called basils, and are used in slipper and saddle making. Tanned with alum and salt, they are called "white leather," and are used as sewing laces. When tanned with oil, they make chamois and wash leathers. Many are split and the grain side tanned and dyed, being then called skivers, roans and moroccos. Tanned with the wool on, they are used as mats and rugs.

Goat-skins rank next in importance, the product they yield being of fine texture, very tough, and possessing good wearing qualities. They are the source from which are made gloves, true moroccos and upholstery leathers.

Horse-hides, intelligently tanned, make upper leather for boots which is nearly waterproof. Their chief use, however, is as enamel or japan leather for upholstery work.

Seal and porpoise hides make the best class of boot laces. Hog and pig-skins are tanned for saddles, leggings and bags, being especially desirable for their hard wearing qualities.

Tanning Materials.

The following materials are used in the course of tanning:—Vegetable tanning materials, such as the bark and wood from oak, chestnut, wattle and quebracho trees; the leaves from the sumach and gambier shrubs; the seeds and fruit from the algarobilla and myrabolan trees; the roots of the mangrove. Mineral tanning materials, such as potassium bichromate, sodium chloride (common salt), aluminium sulphate (alum). The following chemicals are also used in the preparation of tanning:—Calcium oxide (lime), sodium sulphide, lactic and formic acid. Oil tanning materials, such as the aldehydes formed from the decomposition of fish and certain vegetable oils.

For currying the following materials are also used:—Vegetable oils, as linseed and castor oil; animal oils, as cod, whale, herring and neatsfoot oil; mineral waxes, as paraffin wax; animal waxes, as stearine, wool grease (degras and sod oil); certain vegetable waxes used in the finishing process.

For the dyeing and colouring, the following natural dyes were used in former times:—arnatto, madder, peachwood, fustic and logwood. These have, however, been almost entirely replaced by the valuable and varied aniline dyes.

Manufacturing Processes.

The manufacture of leather divides itself into three principal processes:—

(1) The removal of all extraneous material from the hide not required in the finished leather, such as dirt, hair, and, for certain classes, a proportion of the hide fibre. This process is called *liming and bateing.*

(2) The impregnation of the hide fibre left from the above process with whatever tanning material is adopted. This process is called *tanning.*

(3) The final process of rendering the tanned leather flexible and permanently pliable for its special use and the colouring of it. This process is called *currying and dyeing.*

The first process, *liming and bateing,* usually divides itself into three operations:—

(a) The removal of all salt or curing material and the freeing of the hide from all blood and dirt, thus bringing it back into a soft fresh condition similar to what it was on removal from the carcase. This is done by soaking and washing in water with or without the use of chemicals.

(b) The dissolving of all keratins, hair follicles, and the saponification of the natural grease. This is done by plunging in baths of milk of lime, with the addition, in certain classes of leather, of chemicals, as sulphide of sodium, red arsenic or sodium carbonate. All waste hair and flesh is also removed by mechanical means at this stage.

(c) The removal of the lime used in the above process, which, if left in, would be precipitated by the tannic acid forming tannate of lime and ruining the leather. For all soft flexible leathers, such as skins and upper leather, it is also necessary to dissolve a certain amount of the hide fibre, and to break up the binding material of those fibres. When the mere removal of the lime is required acids are generally used, those in chief favour being the weak organic acids, as lactic, acetic and formic acid. If a more complete breaking down is required, bacterial action is necessary. This bacterial action is obtained by the use of infusions of hen manure (bateing), dog dung (puering), bran (drenching) and patent chemical preparations.

Having now converted the hide, free from all hair and flesh, into a clean soft pelty condition, it is ready for the second process, called *tanning*. This consists in passing the pelt through gradually increasing strengths of tan liquor. This liquor is made by preparing infusions of whatever tanning material is considered necessary for the class of leather to be turned out.

In vegetable tannages the action which takes place is both chemical and physical. The acid in the liquor plumps and swells the pelt, combines with the hide fibre (collagene), and is also deposited in the interstices of the fibre, thus both preserving and increasing the weight of the pelt.

In the mineral tannages the action is almost entirely chemical, being the basic precipitation of the mineral in the hide fibre. Here there is little or no filling action, hence all mineral tannages, although more permanently fixed, being true chemical combinations, are light weighing, to a certain extent waterproof, but also non-porous.

The tanned pelt has now to be prepared for final use. If allowed to dry in its rough tanned state, it would be hard and brittle, and in the case of mineral tannages would eventually undergo a chemical change, owing to the excess of chemical material remaining in the hide. This third process is generally called *currying*. In the case of hard, firm leather, such as sole, all that is necessary is a light oiling in order to prevent the oxidisation of the tanning material on the surface, and a more or less severe pressing together to bind and consolidate the tanned fibre. With upper leathers the process is much more complicated, according to the class of leather required. The leather is generally first reduced to an even substance by paring (shaving), or divided into one or more layers (splitting). The next step is to thoroughly impregnate it with fats, oils and waxes and dry it out. Certain mixtures of these ingredients are used according to the class of leather desired.

Coloured leathers have in addition either to be dyed or stained. If dyed they are immersed in the dye solution, and both sides are thus coloured. If stained the dye solution is usually applied on one side only; that is the grain side, and the flesh side is left uncoloured.

All the above processes, however, although simple in theory, are very complicated in practice, and the slightest irregularity or accident

in any one of them may prevent the proper carrying out of the following process, and will certainly cause a variation in the finished leather. Another point is that no two hides or skins are alike, and until the tanning process is complete, they are highly susceptible to bacterial action and damage.

The time required to complete these processes varies according to the methods employed and the class of leather required, sole and such like leather naturally taking longer to complete than the lighter and thinner leathers. Generally speaking, the more gradual the process of penetration, the more permanent the fixing of the materials employed, the more serviceable, and the more expensive the resultant leather.

Suitability of South African Hides.

With regard to the suitability of South African hides and skins for the various classes of leather, the following facts are interesting:—

Sole leather is required to be heavy, plump and well grown (although a thin leather well tanned and rolled is much more serviceable than a thick, porous, soft one). South African hides, being by their nature thick and plump (in other words, of greater density), are much more suitable for sole leather than the thin, spready Australian hide.

Harness and upper leather, on the other hand, although sold by weight, are costed up by the user on their surface measurement. It therefore follows that for these purposes the thin, spready Australian hides are more suitable than the South African ones.

As regards skins, nothing in the world except perhaps the Scotch skin can beat the pure Cape skin for strength and texture, and they are eminently suitable, as the world's demand proves, for gloves and such like leather.

As a rule South African hides and skins are, as regards their natural qualities, quite as good as those from any other part of the world, but, as before stated, the bad flaying and frequency of brands and scratches detract considerably from their value.

Given a hide free from these defects, and using the same care and attention as employed in England, there is no reason why the resulting leather should not be quite equal to the best English tannages.

Bye-Products.

The following bye-products are obtained in fairly large quantities, and have no direct value to the tanner:—

Hair is removed from the hide in a wet sodden mass, and contains a large amount of lime. When washed and beaten free from the lime it is useful for plasterers, upholsterers, and to iron founders for core making and loam casting.

Fleshings and Glue Stuff.—The various scraps of flesh and fat are usually sold for glue. If they cannot be sold for a fairly good price, it will pay to boil them down to recover the fat. Except under special

conditions, it does not pay the tanner to do these operations, as the plant is somewhat expensive, and the operations are best carried out on a wholesale scale.

Spent Tan (that is, the tanning barks, etc., when exhausted of their tanning properties).—On the whole, in spite of its very low calorific value, spent bark is best utilised as a fuel, but for economical use it requires special furnaces having a large grate area, giving a correct and sufficient supply of air, and a combustion chamber of a very high temperature.

Spent Lime is useful if applied to heavy lands.

Generally speaking, there is no demand at present for these bye-products in this country.

The Site Chosen.

In selecting a suitable site for a tannery, the following factors must be considered:—

(1) Facilities for a cheap, pure and abundant water supply. As a general rule the softer and purer the water the better. It is also a great advantage if the source is at such a level that water can flow into the tannery without pumping.

(2) Facilities for drainage and disposal of waste liquors.

(3) Suitable commercial facilities, such as nearness to markets and the sources of supply of raw material, the availability of rail and water carriage. In England the tendency is for the small country tanneries to die out and be replaced by large concerns near the ports, as Liverpool, Hull, Bristol, or in the great consuming centres having good rail connections, as Leeds and Northampton. In London the high cost of land is driving the tanneries away from that centre.

(4) Possibility of causing a nuisance from smell. Really injurious smells are not caused in a tannery, but it is impossible to prevent odour, and a single disagreeable neighbour may cause endless trouble and expense.

(5) A clay or loamy soil is best, to prevent leakage or waste of liquor.

Buildings.

The following points should be noted in the arrangement of the buildings:—

If the land is cheap, it is better to erect the drying sheds—which should be extensive—over the currying and finishing shops, and not over the pits. On the other hand, the pits must be covered. Tan liquors are expensive to make, and it is surprising the amount of money unconsciously lost in open tanyards by evaporation and the dilution by excessive rain.

Iron roofs are not suitable, as moisture condenses on and rusts them, and particles of iron oxide fall into the liquors and cause iron stains. Good ventilation is necessary, and sufficient light, but if possible avoid

the direct rays of the sun. In South Africa care should be taken to avoid facing the quarter from which the prevailing wind is of a sharp, drying nature.

In arranging the general lay-out, as far as possible see that the hides and leather work straight forward from one department into another with as little wheeling or handling as possible. Place machinery as near engine as possible, to avoid waste of power transmission. With electric driving this is very easily arranged. Minimise fire risk by isolating the separate buildings; put boiler house and all grinding operations in separate buildings. Always leave room for extension without upsetting the general plan.

Capital Required.

The amount of capital necessary to start and run a tannery is very difficult to estimate; so much depends upon the place selected, class of leather turned out and methods of manufacture employed. As a rough guide, I will give an estimate for a small plant necessary to turn out 200 sides of sole leather per week and taking twenty weeks to tan from raw hide to finished leather.

The land required would be about 5,000 square feet. Leaving the price of this out of the account, the following would be sunk in fixed capital:—

Excavations: 12,500 cub. ft. at 1d. cub. ft.		£52 1 8
Forty pits, various sizes, at average cost of £25 each		1,000 0 0
Roofing over 5,000 sq. ft. at 2s. sq ft.		500 0 0
Buildings		£1,552 1 8
One boiler, 60 lbs. pressure	£80 0 0	
One electric motor, 20 h.p.	80 0 0	
One electric motor, 10 h.p.	30 0 0	
One disintegrator	30 0 0	
One rolling machine	130 0 0	
One liquor pump, brass fittings	50 0 0	
Steam piping and sundries	100 0 0	
Plant		£500 0 0
Making for Fixed Capital		£2,052 1 8
100 hides at £3 each per week for 20 weeks		£6,000 0 0
Labour, materials, etc., for 20 weeks		1,050 0 0
Making for Working Capital		£7,050 0 0

Total Capital Required, £9,102.

Of course this must be only looked upon as a very rough guide. If other leathers are made, such as kip, a much larger expenditure in plant is required; also a higher price has to be paid for labour, as the manufacturing operations call for more careful and skilled workmanship.

In order to give some idea of the relative importance of our subject in the general trade of South Africa, I append the figures taken from the Customs Returns shewing the imports and exports compared with the total trade figures for the years 1912-1916:—

EXPORTS.

	1912 £	1913 £	1914 £	1915 £	1916 £
Exports, less Gold, Diamonds and Feathers ...	11,468,905	12,507,380	11,094,242	12,608,244	15,652,917
Leather & Leather Manufactures	2,350	2,283	1,704	6,514	21,478
Ox and Cow Hides	670,887	794,937	544,050	575,945	811,338
Goat-skins ...	291,695	325,936	270,190	264,875	414,777
Sheep-skins ...	724,196	889,611	753,273	827,590	1,084,042
Hides, Skins and Leather ...	1,689,108	2,012,767	1,692,517	1,674,924	2,331,635

IMPORTS.

Total Imports ...	35,924,067	38,408,598	31,168,665	29,052,846	38,429,564
Leather, unmanufactured ...	201,397	213,651	162,053	233,513	120,203
Leather, not otherwise described	135,064	126,874	80,358	53,234	74,375
Saddlery and Harness ...	81,825	69,587	41,716	6,796	7,323
Hides and Skins	5,735	12,803	6,394	23,281	69,181
Hides, Skins and Leather ...	424,021	422,915	290,521	306,824	271,082

In concluding this report, the following are the points in favour of this country as regards development:—

(a) There is a great demand for the raw products—that is, hides and skins.

(b) There is a great shortage, and will be for some time, of the manufactured article—that is, leather.

(c) This shortage will be beneficial to the development of the manufactured article, as it will cause a demand for South African manufactured leather, and will compel users who favoured English to test South African, and thus prove to them the fact that good South African leather can be obtained.

The disadvantages are:—

(a) The raw product being in world-wide demand, its price has increased enormously, thus handicapping the South African manufacturer.

(b) The defects before mentioned, *i.e.*, bad flaying, scratches and brands, militate against the South African tanner being able to make the finer classes of leather.

(c) Lack of sufficiently trained and skilled workmen to take charge of the higher positions in the trade.

However, time will remedy these defects. With the demand for better leather will come the necessity of more care being taken with the hides; skilled workmen can either be trained or imported; the public, compelled to use South African leather, will, on proving its good qualities, lose their prejudice against it; the demand, already great, will be still further increased; encouraged by increased turnover, the tanner can safely modernise his plant and methods. Thus some future day, having satisfied the needs of this country, he may successfully compete in the export of leather.

Composition of Fertilisers.

The following list of fertilisers and farm foods registered in this Territory is published in terms of section 35 of Regulations under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance, 1914," which provides that "The names, brands and guaranteed composition of all fertilisers and farm foods registered under these regulations, together with the names of the manufacturers or importers, and such additional information, including reports of analysis at the instance of the Government, as circumstances may render desirable, shall be published from time to time in the *Government Gazette* and in the *Agricultural Journal.*"

Nature Notes.

VIII. BEES; THEIR NATURAL HISTORY AND INDUSTRIAL VALUE.

By the Rev. James Kendal, S.J.

Every industry has its moral as well as its commercial side, and industrial ethics have much more to do with the permanent well-being of a community than all the laws of the classical economists. Every kind of material on which human energy is expended has its peculiar dangers as well as its peculiar utilities. Gold, whose specific gravity is 19.2, often makes its possessors morally top-heavy, and even the national beverage of the devout Scotsman has been known at times to disturb that imperial balance of mind which is the well-known monopoly of his nation.

Bee-keeping is no exception to the rule. It has its dangers, both moral and physical. It is apt to quell the faint ardour of irresolute beginners, for, if honey is popular, gratuitous hypodermic injections, even though incidentally they may be a cure for rheumatism, are by no means popular. Moreover, though initial difficulties are not usually the greatest in themselves, they are the most formidable to prospective beginners, and the difficulties of bee-keeping are mostly initial. Bees are not as docile as poultry, and if they are kept near live stock, they may do more damage than they are worth. Carniolan bees are gentle, so are Italians. English bees are moderately savage; those of the Cape are, apparently, more so; and Rhodesians are worst of all. When angry they shew a Napoleonic insight in finding out the weak point in an enemy's defence, and if the face and hands of the operator are well protected, they will at once detect any lucid interval that may exist between the trousers and the boots. Hence the apiary should be kept in a secluded spot, and the bee-keeper must know how to protect himself in case of a general attack. English manuals of bee-keeping very properly impress on their readers the idea that if the bees are badly roused, it is sure to be the fault of the apiarist. In point of fact, gloves are seldom required in dealing with English bees, but it is not so in Rhodesia. Rhodesian bees have all the pugnacity of an Irish farmer who objects to being rack-rented. They are gentle enough during the slack season, and will allow combs to be removed and examined without resisting, but they display a vicious susceptibility when they are being robbed. Yet Rhodesian bees have their virtues. In a good season, and in a good district, they will store heavily, while the most vicious colonies

are often the best workers. Their temper may be improved by selective breeding. So may their tendency to excessive swarming. It is doubtful whether, on the whole, a race of imported bees will do better in this country than the natives. Bees from a cold climate, where they are accustomed to gather heavily during the few weeks, or even the few days, that the main honey-flow lasts, are said to become idle in a hotter climate, where less provision for the future is required.

It is quite true, no doubt, that an apiary with a hundred hives peopled by Italians, and kept pure by imported queens, will give better results than a hundred Rhodesian hives, with their rebellious instincts and their tendency to swarm; in fact, a hundred hives of unimproved Rhodesian bees would be too tough a proposition for most people to tackle. The outlay would be less, but the work would be dirty, in view of the temper of the inmates. But with a few colonies, say fifteen, the difficulty is less. The robbing of the hives can, if necessity becomes the law, be carried on after dark, when the bees do not readily take wing, and there is no live stock about, for angry bees are impartial, and sting enemies and neutrals quite promiscuously. Timid beginners may do well to try Italians; but the bold course is to take up Rhodesians, learn to love them, and try to improve them.

Every aspiring bee-keeper should read a good text-book, and take a bee journal—at least until the subject matter becomes too familiar and stale for profitable reading. Reading and experience supplement one another, and experiments without previous theory perpetuate ignorance, and lead to final discouragement. This article is not intended to supply all the necessary equipment of knowledge. It is meant to stir up a little enthusiasm, and to induce as many as possible of the right people to utilise the supplies of sweetness which, in a good season, abound within a one-mile radius of their doorstep. In the Bulawayo district a good crop of honey may be secured at the very end of the dry season. Last year, during the month or so ending on 20th October, the present writer, with fifteen hives, secured about 300 lbs. of clear, thick honey from the Tetjani bush, and this supply is pretty regular. The spring time is not the main season, which comes naturally after the January rains, the full harvest being commonly gathered about April. At that time a yield of 60 or 70 lbs. by a hive is nothing very remarkable.

The inner economy of a hive should be well understood before practical work is undertaken. A prosperous colony, about the end of September, consists of a fertile queen, a few hundred drones, and from thirty to fifty thousand workers. The queen differs from the workers in size, shape and colour. She is somewhat larger than they are, has comparatively shorter wings, and is longer and more slender in structure. The drones too are larger than the workers, and more bulky in shape than the queen. The purpose of their life is to impregnate the newly-hatched queens, and when their services are no longer required, they are ruthlessly driven out by the workers.

Let us suppose that a young virgin queen has just emerged from her cell in a hive, which has been deprived of its old queen by a swarm or in some other way. One of her first acts is to destroy her sister queens who are just on the point of hatching out from their cells. This

she is prevented from doing by the workers whenever they have made up their mind to send out a second swarm (or "cast," as it is called). When this happens, the emigrant bees are headed by the virgin queen who has failed in the attempt to destroy her rivals. After the last swarm has departed, only one young queen is allowed to survive. Within a week or so after her birth she issues forth from the hive on her mating flight, and after meeting the drone, who dies within a few hours of the accouplement, she is rendered fertile for life, which in her case may last from three to four or five years. In a day or two after impregnation, which always takes place on the wing, she starts her maternal duties, and begins to fill the combs of her brood-nest with eggs. When in her prime, she is capable of laying from two to three thousand eggs a day, and a vigorous queen will do so for days, and even weeks, in succession. In other words, she yields every day a quantity of eggs which is equal, on the lowest computation, to twice her own weight. More properly, it is four times her weight, for at this period more than half her weight consists of eggs; so that in the winter her weight is one-fourth of that of her daily yield of eggs in the summer. It may be wondered how she achieves this prodigious result without any strain on her energies; for it would seem that her powers of digestion must be equal to those of a man who is able to eat up the better part of an ox and feel perfectly well the next day. Such, however, is not altogether the case; in fact, her stomach is smaller than that of the worker, but, by an admirable division of labour, the task of digestion is performed for her by hundreds of worker bees, which keep her supplied with digested food which, with little or no defecation, is rapidly transformed into eggs.

For the reception of these eggs three kinds of cells are provided. The worker cells run approximately five to an inch or twenty-five to the square inch. The drone cells are larger, and sixteen of them take up about one square inch. The queen cells are quite different from either. They are of about the size and appearance of an acorn in its cup, and commonly hang down perpendicularly from the lower edge of the combs. By far the greater part of the eggs are laid in the worker cells, but the queen has the power of laying drone eggs at will, whenever drone cells have been provided by the workers to receive them; in fact, as Dr. Dzierzon discovered, drone eggs are produced by parthenogenesis. He says: "All eggs which come to maturity in the two ovaries of a queen bee are only of one and the same kind, which, when they are laid without coming into contact with the male semen, become developed into male bees; but, on the contrary, when they are fertilised by the male semen, produce female bees." The process was thought by some authorities to be purely mechanical. When the queen lays an egg in a narrow cell her abdomen is squeezed, and the pressure is transmitted to the sperm-sac left with her by her mate, with the result that a spermatozoon is set free and enters the egg, changing it from male to female. Against this theory, however, we have the fact that if the queen is provided only with drone cells, she will still lay worker eggs in them, though there is no mechanical pressure. All eggs then, before fecundation, are fatherless; moreover, just as every egg before it is laid is actually male but potentially female, so, after fecundation, the female egg is potentially

a queen or a worker. The difference is secured by the different treatment of the larvæ after they are hatched from the egg. All the newly-born grubs are fed by the workers on a kind of pap or digested food during the first three days of their existence, but on the fourth day after hatching the worker larvæ are weaned, and their nurses begin to feed them on honey. The queen, on the contrary, is never weaned, and her continued feeding on pap (or "royal jelly," as it is sometimes called) serves to make her development more rapid, as well as more complete.

The various metamorphoses of bees and their periods of transformation are well explained in the following table, which we borrow from Mr. T. W. Cowan's work, "The British Bee-Keeper's Guide-Book":—

	Queen days.	Worker days.	Drone days.
1. Time of incubation of egg	3	3	3
2. Time of feeding the larvæ	5	5	6
3. Spinning of cocoon by larvæ	1	2	3
4. Period of rest	2	3	4
5. Transformation of larvæ into nymphs	1	1	1
6. Time in nymph state	3	7	7
Total	15	21	24

The queen then is hatched out from her cell as a perfect insect on the sixteenth day after the laying of the egg. A worker emerges on the twenty-second and a drone on the twenty-fifth. As the queen usually leaves the hive for impregnation from the third to the fifth day after emerging from her cell, and as she begins to lay eggs usually about forty-eight hours after her nuptial flight, she is likely to be already a mother before her brother drones of her own age are hatched from their cells. The worker bee commonly, but by no means always, stays a fortnight in the hive before issuing forth to gather honey. Her early days are spent in nursing the larvæ, and in feeding them and the laying queen with digested food. It seems too that drones are dependent on chyle-food given them by the workers, and that if this food is withheld, they die after three days in the presence of abundance of honey. This would account for the quiet way in which they are driven out at the end of the season. The death rate of bees varies with their activity. On a very rough computation it may be said that a worker lives six weeks in summer and six months in winter.

An important question for beginners is that of how they are to procure stocks. In many districts they can easily be got for nothing. There are plenty of run-away swarms in Rhodesia which cause trouble by taking possession of wardrobes, water meters, the hollows under floors, or between the metal and the match-boarding of iron houses; in fact, all sorts of places where their presence is inconvenient and dangerous. If, therefore, a hive fitted with frames that have been properly arranged with a strip of wax comb foundation is placed about the premises, the bees are likely to take possession of it before very long. South African swarms do not take to hives in which they have been placed by the bee-keeper as readily as do English bees, but when they come of their own accord to a well-prepared hive, they are inclined to

stay there. Light decoy hives may be placed in likely localities, and when occupied and properly established transferred to their permanent location. It must be remembered, however, that if a hive is moved more than a yard, or less than a mile or a mile and a half, many of the bees are likely to be lost. The rule often adopted in England is, I believe, "not more than two feet or not less than two miles." The reason for this is supposed to be that, when hives are moved a long distance, the bees take new bearings; but if the distance is short, they fail to do so.

With bee-keeping, as in other rural industries, better results are doubtless obtained by high farming than by low farming. The repression of swarms and the selection of queens will naturally make a great difference in the output of honey. At the same time, in a good season, it will happen that most of the stocks will give a very good yield without much interference on the part of the apiarist. His main business is to give them plenty of spare room to store their harvest. The work of re-queening, the cutting out of drone-comb to lessen the chances of swarming, and other interferences with the domestic economy of the hive are not quite so easy with cross-tempered Rhodesian bees as they are with gentler races. But pleasure and profit are got from many a hobby without absolute scientific precision on the part of the rider thereof, and it may well happen that a steady and careful bee-keeper, without being very enterprising, may still find that his industry is well repaid. When the rainfall is good, he may easily gather an average harvest of 70 or 80 lbs. of honey per hive. An expert will do better, but without perhaps being always quite sure that the extra profit has been worth the extra labour.

The average yield per hive will vary greatly according to circumstances. Districts differ enormously, and the average of a given district will vary according to rainfall. The following is a list of results of an extensive apiary in California :—

Year.	Inches of rain.	Number of colonies.	General average in pounds of honey.
1876	21¼	150	200
1877	4⅛	300	0
1878	20¼	150	275
1879	12¾	300	0
1880	22 7/16	200	175
1881	13⅝	400	20
1882	11 1/16	120	15
1883	11¾	150	40
1884	41¼	160	100
1885	8⅞	200	0
1886	28⅝	240	175
1887	16⅝	330	10
1888	20	400	50
1889	24⅜	420	36
1890	39½	430	60
1891	19¾	450	21

It will be noticed how the apiary in question was reduced after a drought. When the bees died of starvation, weak colonies had doubtless to be united together to form workable stocks for the next year.

The table below gives the averages for seven years of an apiary in Sussex :—

Year.	Inches of rain.	Average in pounds per hive.
1885	29.68	42
1886	31.62	28
1887	23.44	34
1888	29.83	4
1889	27.53	66
1890	24.13	14
1891	27.79	60

The averages, roughly calculated, for the writer's apiary in Bulawayo during the last six years are as follows :—

1912	48 lbs.	1915	53 lbs.
1913	85 ,,	1916	30 ,,
1914	33 ,,	1917	31 ,,

The October harvest is counted as belonging to the following year.

For the practical work of bee-keeping, and for an account of the various appliances that are necessary for the proper management of an apiary, an approved text-book should be read and mastered. T. W. Cowan's "British Bee-Keeper's Guide" is cheap and practical; so is his more scientific work, "The Honey Bee," which is meant for readers who wish to know the biology of bees. The prices of these books, as quoted from an old catalogue, are 2s. and 5s. 6d. respectively. An American work, "The A B C of Bee Culture," by A. I. Root, is profusely illustrated, and costs 12s. 6d.

Notice.

SAMPLES OF DIP FOR ANALYSIS.

We have been asked to bring to the notice of farmers who send samples of dip by train to the Chemical Laboratories for analysis that carriage must always be pre-paid, otherwise the samples will not be accepted. The charges for freight cannot be met by the Government.

Fundamental Principles of Co-operation in Agriculture.

Extracts from an article by G. Harold Powell.

Published by the University of California.

The co-operative organisation differs fundamentally from the capital stock corporation conducted for profit. A capital stock corporation for profit is organised to return an earning and a profit on the capital used in the business. The basis of administration, control and the distribution of earnings is the capital invested in the undertaking. In a co-operative organisation, the basis of control is the membership, where each votes equally irrespective of the volume of his business; while the earnings, if they occur, are returned to the member in proportion to the volume of business he transacts through the organisation. The basis of the co-operative organisation is men; of the capital stock corporation, money. Capital cannot co-operate; products cannot co-operate; only men can co-operate.

There is much confusion in the use of the term "co-operation" as applied to agricultural efforts. It is commonly applied to any group of farmers who associate themselves together. They may organise as members of a voluntary unincorporated association of individuals; or as an incorporated capital stock association to handle farm crops for profit or for other purposes, or as non-profit corporations without capital stock. The term needs to be defined. It is believed that its use as applied to business organisations in agriculture should be restricted to incorporated associations, societies, exchanges, or agencies which are formed exclusively for the benefit of the members; whose voting power is based on equality of membership; whose membership is confined exclusively to active producers, the membership ceasing to exist when the producer withdraws from the organisation, and whose earnings are distributed on the basis of the product, rather than on the capital contributed by each member, after a fair rate of interest is paid for the use of capital actually employed in the business, if any, and other overhead charges are deducted. A co-operative organisation, therefore, is not a corporation in which the capital is contributed primarily in order that it may earn a profit; nor one composed of producers and non-producers; nor one in which the producer's product is handled by a corporation for the benefit of the stockholders rather than for that of the members; nor one in which the membership is not under

the control of the organisation; nor one in which the members do not actually control the organisation. It is an association of farmers who unite in an effort to handle their common interests through an agency which is controlled by them, on the principle of an industrial democracy, and exclusively for their benefit.

As a result of organising a so-called co-operative association under the usual stock corporation laws, many of these organisations often pass into the hands of non-producers or of rival interests, following the withdrawal of members through the sale of farms and the sale and transfer of stock; or a partial control may be held by dissatisfied stockholders who have withdrawn as members.

One of the common difficulties in a so-called co-operative association formed as a stock corporation results from the payment of dividends on the paid-in capital, especially where the capital contributed by the members is not proportional to their individual shipments. The tendency in such organisations is to pay high dividends on the stock. The stockholders generally demand an unusual earning on the capital contributed. They acquire the dividend habit. They deduct an amount from the proceeds from the product of all members, or from the earnings of the company, to pay the dividend, before returning the proceeds to the growers. In some fruit growers' organisations, dividends of 20, 30 or even 50 per cent. have been paid on the capital stock.

A farmers' organisation that has been organised under the usual stock corporation laws is on an uncertain foundation, not alone from the lack of control of the membership, but also because of the conflict between the capital and the product of the members whenever the proceeds derived from the latter are reduced to pay an unusual rate of interest on the capital contributed.

An organisation that pays a profit to capital from the growers' product, either for the use of packing facilities or for any other service, is not co-operative. It is a stock corporation, operating for the grower for profit on capital, while a co-operative organisation is operated by the producers wholly for their own benefit, the benefits being *pro rated* on the use which the member makes of the organisation.

A co-operative organisation of farmers must be founded on economic necessity, if it is to be permanently successful. The reason for its existence must lie in some vital service which it is expected to perform, if it is to have strength enough to live in the face of the competition to which it will be instantly subjected. It must compete with existing organisations, and this competition will be directed towards eliminating it; it will be viciously attacked; every conceivable form of misrepresentation will be levelled against it; the officers will be attacked by insidious rumours concerning their ability or integrity; and every weapon known to competition, either legitimate or disreputable, will be used to put it out of business.

The average producer is not a business man, nor is he skilled in the arts of competitive business. He is naturally a strong individualist. He is slow to delegate authority over his affairs to anyone, and when

he is face to face with the skilful arguments of those who aim to break the organisation and keep him working as an individual, he is likely to weaken and finally leave the organisation unless he has felt the effect of hard times, a helplessness arising from a combination of those who buy or sell his products, excessive freight, or commission charges, or other forms of oppression. It is a historical fact that the investment of the farmer must have been threatened by existing conditions before he has been able, in the past, to overcome his individualism sufficiently to work with his neighbours in co-operative work. The country is strewn with the wrecks of co-operative organisations that were born prematurely and which died by the wayside, because the farmer himself deserted in the first real conflict with the established agencies that have handled his business. Co-operation, to be successful, must be founded not only on economic necessity, but it must grow through gradual evolution. It must have a small beginning, and grow in strength through experience step by step, rather than by leaps and bounds. The fundamental mistake that is being made in many localities is to form a farmers' organisation all at once on the plan of an organisation that has taken years to develop. The plan may be sound, but a co-operative organisation can only succeed when given the unflinching support of the members who through years of experience have acquired an appreciation of the fundamentals that underlie a successful association of this kind. The success of any organisation depends on its members, not on its form.

The membership in a co-operative organisation should be confined exclusively to those who are producers, and who, as producers, use its facilities. The members should be acquainted and have confidence in each other. It should never include those who contribute capital alone to it. Many organisations are formed by bankers, fruit dealers, or others who promote an organisation for the purpose of making a profit from it. They may be formed in good faith by business men who realise the value of the co-operative movement, and who are willing, as a service, and not for profit, to furnish the capital for its organisation. The need for such an organisation must spring from within, from the necessity of the industry, and not from a desire of a commission merchant, a broker, or of an ambitious manager who sees an opportunity of capitalising the co-operative movement for his personal benefit.

Membership in a co-operative organisation should carry with it a responsibility on the part of the member strong enough to carry it through adversity of every kind. To feel this responsibility, the member must of course feel the necessity for the organisation; he must feel that he is part of it; that the organisation is his, developed and managed to promote and protect his interests. If the association is formed by the members to meet their economic needs, this feeling of responsibility pervades the membership, but if the association is formed to promote the welfare of the officers or any other class of people, or if financed by well-meaning people who really desire its success, an association cannot depend on the loyalty of its members in time of adversity.

One of the problems that a co-operative association always has before it is keeping alive the interest of its members. They must be a vital part of the organisation. They must take an active part in its development. They must keep posted on the details of the business; the business methods of the organisation must be an open book to them. There can be nothing mysterious about the management of the business. Contracts, salaries, trade or other legitimate rebates, railroad claims, profits or earnings of every kind—these must be of such a nature that every producer can know about them if a co-operative association is to maintain the loyal support and confidence of its members. It must, of course, win that support by the results it accomplishes, and these results must be obtained by a business record that keeps free from suspicion regarding the integrity of its methods, and as free as possible from criticism regarding its business efficiency. Every defect of the organisation will be kept before the members by its competitors, and imaginary defects, created by wilful misrepresentations by those who aim to break down the membership, will always be prominently featured.

In a strictly co-operative organisation a fundamental principle should be "one man, one vote." It should be a real industrial democracy in which the members trust each other and lean upon each other's judgment as men. In such an organisation neither the capital contributed nor the volume of business transacted should be the basis of the responsibility or influence of the individual member, because neither can co-operate or be made a basis for lasting co-operation. In the European co-operative associations the "one man, one vote" principle is applied as a test to separate the true co-operative associations from the pseudo co-operative. Since co-operation is founded on man, not on capital nor on products, there is no fundamental difference in principle where capital is eliminated and product is substituted as the basis of voting and control. The control of a co-operative association should be founded on the equality of membership, whether the member contributes a large or a small volume of business. It is the members who, as men, co-operate in these organisations.

There is a strong sentiment against the "one man, one vote" principle of voting when first presented to the average producer. The large producer fears control by smaller interests; the small land holders, domination by their larger neighbours. The history of the co-operative movement, both in Europe and in the United States, shews clearly that this adverse sentiment is a prejudice rather than an actual weakness in practical operation. Equality of membership strengthens the desire to co-operate, and men work together in business harmony just as they now do in the equal control of churches, schools and in governmental responsibilities.

The success of a co-operative organisation depends primarily on the loyalty and stability of the membership; it depends further on efficiency in management. Efficiency in management cannot exist without stability of membership; nor can it be developed unless the members appreciate the necessity of providing an efficient management. The difficulty in most co-operative organisations is the lack of appreciation of the need of a high order of organising and business ability on

the part of the employees of the association. The common failure of co-operative associations is usually attributed to inefficient management; as a matter of fact, it is due to the membership itself, which has fallen short in securing skilful employees. The individual producer is likely to gauge the requirements of management by the size of his own business. He falls short in his estimate when he acts on a board of directors and is charged with the responsibility of providing a management to handle successfully a collective business. Inefficient management is a measure of the degree of business efficiency of those who are charged with the direction of the affairs of the association; and unless the membership will sustain a board of directors in employing men of a high order of ability a co-operative association is short lived.

A management must possess tact, constructive ability, foresightedness, fearlessness in the conduct of the business, and a clear conception of the real underlying purpose of the organisation, if it is to succeed. The integrity of the management must be beyond reproach; it must be free from entangling business alliances; it must be free from the participation in any secret profits arising directly or indirectly from handling the business of the organisation; in short, the dealings of the management with the organisation must be an open book, free from questionable business practices of every kind. The influence of the management, next to the loyalty of the members, exceeds all other influences, and the success of a co-operative association depends on its working out in mutual confidence an efficient business system that is able to meet successfully all conditions as they arise.

A co-operative organisation should be founded on a special crop, and the locality in which it handles the product should be comparatively restricted. Special industries involve common problems to be solved by the producers, similar difficulties to overcome, similar trade practices and similar trade connections. The members of an organisation that is formed to handle fruit, vegetables, poultry and general farm crops have no common ground on which to stand, and these general associations have not been successful up to the present time, because the membership cannot be held together. An organisation founded on different crops has a series of totally different problems to meet at one time, different business connections to form, and different classes rather than one class of opponents to meet.

Maize Foods for the Home.

(Continued.)

MAIZE WITH MEAT.

CHICKEN TAMALES.

(Mexican Recipe.)

Scald a quart (4 cups) of maize meal, using water to make it quite moist. Put a layer of the meal into some maize husks, forming a roll about six inches long in the centre of the husk.

To a pint (2 cups) of cooked chicken, chopped fine, add a Spanish pepper chopped fine and a teaspoonful of salt; put two tablespoonfuls of this mixture into the centre of the maize meal, roll the meal over the mixture, and the husks over the meal. Fold the ends of the husks and tie with narrow strips of husk. Put the bones taken from the chicken into the bottom of a kettle, add a sliced onion, three or four cloves, a bay leaf, salt and pepper, cover with cold water and let heat gradually to the boiling point. Lay the tamales upon the bones above the water and cook about 2 hours. Serve hot in the husks.

TAMALE DE CASUEL (MAIZE MEAL POT PIE).

(Mexican Recipe.)

Ingredients.

1 *Quart maize meal.*
1 *lb. pork or chicken (or both, mixed).*
4 *Tablespoonfuls butter.*
3 *Large spoonfuls flour.*
2 *Eggs, beaten.*
½ *Can of tomatoes.*
2 *Tablespoonfuls chilli powder.*
Salt.
Broth.

Slice the pork or chicken small, add a little salt, boil till tender. Scald the maize meal, add salt and butter, flour, and the beaten eggs, and enough broth to make a batter. To the tomatoes add a little butter, the chilli powder, and cook till well done. Add this to the meat, mix well. Line some pie-pans with the meal mixture, put in the meat, place in layers as for chicken pie, bake very slowly, and, when nearly done, dress over with butter to brown.

MAIZE AND PORK SCALLOP.

Cut about 2 lb. young pork into neat chops and reject all fat and bone. Fry them until well cooked and of a pale brown, dust with salt and pepper. Cut some green maize from the cobs. Take a pie-dish, put a layer of maize in the bottom, then a layer of pork, and so on until the dish is full, add 1 pint of water, cover and bake for one hour. Remove the cover 15 minutes before serving, so that the top may be nicely brown. Serve with potatoes and a lettuce salad.

MAIZE MEAL BALLS TO SERVE WITH MEAT.

Make porridge as in recipe for "Maize Meal Relish," using but 1½ cups of boiling water. Add 1 egg well beaten, 1 teaspoonful butter, and 1 teaspoonful of chopped parsley. Wet the hands in cold water and shape mixture into balls. Dip into egg and bread crumbs and fry in deep fat; or dip in egg and bread crumbs and lay on buttered baking-pan with a piece of butter on each ball, and bake till brown.

GREEN MAIZE STUFFING FOR FOWL.

Take green maize cut from cob, add bread crumbs, some finely chopped parsley, butter, salt and pepper to taste, and mix all together with an egg.

MEAT SUBSTITUTES.

GREEN MAIZE OMELET.

Beat yolks of 3 eggs, add ¼ cup of milk or cream, 1 cup of canned maize or green maize cut from cob, ½ teaspoonful salt, and a little pepper. Mix well and add whites of 3 eggs beaten till stiff. Melt 1 tablespoonful butter in frying-pan, pour in the mixture, and let stand on the top of stove until set on the bottom. Then put into oven till a knife cut into the centre comes out clean. Cut across the top at right angles to the pan handle, fold, and turn out on to a hot plate.

MAIZE CHOWDER.

INGREDIENTS.

1 *Quart of raw, sweet maize, or*
1 *Quart of canned maize.*

1 *Pint sliced potatoes.*
¼ *lb. fat salt pork.*
1 *Large onion.*
1 *Pint tomatoes (either canned or fresh sliced).*
1 *Teaspoon salt.*
1 *Saltspoon pepper.*
1 *Heaping tablespoon of butter.*
3 *Heaping tablespoons of flour.*
1 *Pint rich milk.*

Cut the maize from the cob. Boil the cobs 20 minutes in water enough to cover them, then remove the cobs, skin the onion and slice one-half and fry with the salt pork. Pare and slice the potatoes; slice the remaining half of the onion, and pare and slice the tomatoes. Mix pepper, flour and salt together. Now put maize, potatoes, tomatoes and onion in the kettle in layers, sprinkling each layer with the mixture of pepper, flour and salt. Strain the fat from the onion and pork into the kettle, also the water from the cobs; cook till the maize and potatoes are tender. Then add the butter and milk, bring to a boil, and serve very hot with fresh, crisp crackers.

NOTE.—If canned maize and tomatoes are used, fully 1 quart of water must be supplied in place of the water from the cobs.

KENTUCKY "CORN" CROQUETTES.

INGREDIENTS.

1 *Quart of maize pulp.*
1 *Pint of cream or milk.*
2 *Eggs, well beaten.*
2 *Teaspoons salt.*
¼ *Teaspoon pepper.*

To the maize pulp add the cream or milk, and cook 20 minutes in a double boiler. Add salt, pepper and the eggs. Set to cool. When cold form into 2-inch squares, 1 inch thick, egg and bread crumb, and fry in hot fat, or bake in the oven till brown. If the mixture be too moist to shape, add a little rolled cracker crumbs.

BAKED GREEN MAIZE AND TOMATOES.

Cut from the cob by first cutting lengthwise, and then with the back of the knife press the pulp out, enough maize to make 1 quart of pulp; 1 quart of peeled and sliced tomatoes.

Now butter a pudding-dish, put in a layer of tomatoes and small bits of butter, then a layer of maize pulp, salt and pepper; then another layer of tomatoes, butter, salt and pepper; then maize, until your dish is full. Then place cracker crumbs on the top, put into a good oven, and bake for half an hour.

GREEN MAIZE CUSTARD WITH TOMATOES.

Ingredients.

1 *Cup maize pulp.*
1¼ *Cups milk.*
4 *Eggs, slightly beaten.*
Salt, pepper, onion juice.

To the slightly beaten eggs add salt, pepper, onion juice, and milk, and the maize pulp. Bake in buttered moulds set in hot water. When firm turn from the moulds and surround with slices of broiled tomatoes. Serve with cream sauce. When green maize is not in season use ¾ cup of canned maize.

"CORN" PATTIES.

Ingredients.

1 *Pint of sweet corn cut from the cob.*
½ *Cup cream.*
½ *Teaspoon salt.*
1 *Egg, well beaten.*
Dry bread or cracker crumbs to form into cakes.

Bake till brown.

"CORN" CUTLETS.

Ingredients.

10 *Ears of young green maize.*
1 *Cup grated bread crumbs.*
1 *Small green pepper.*
Salt, celery-salt, tabasco sauce, a little sweet cream.
2 *Hard-boiled eggs.*

Boil the maize for 20 minutes, cut from the cob, carefully removing any husks or silks. Pass this through a meat chopper with the pepper, the seeds removed, and the hard-boiled eggs. Place in a bowl, add the bread crumbs, a little celery-salt, ½ teaspoon of salt, a drop or two of tabasco sauce, and sweet cream to moisten; mould with floured hands into cutlet form, dip into egg and bread crumbs, and fry in deep fat. Serve on a meat plate garnished with crisp watercress.

GREEN MAIZE FRITTERS.

Ingredients.

1 *Pint grated maize.*
1 *Tablespoonful butter.*
1 *Egg.*
1 *Teaspoonful salt.*
1 *Tablespoonful flour.*
Pepper.

Mix ingredients together, drop on buttered pans, and fry 10 minutes, or drop into boiling fat. Salt and pepper can be omitted, and fritters served with sugar and cinnamon to take the place of pudding.

MOCK OYSTER FRITTERS.

INGREDIENTS.

12 *Young ears of maize (or 4 cups).*
3 *Eggs.*
½ *Tablespoon flour.*
Salt and pepper.

Cut the grain from the cobs, add flour and stir in yolks of eggs well beaten; whisk whites to stiff froth and add last. Season with salt and pepper. Drop a tablespoonful at a time on hot, buttered griddle, and fry on both sides.

If eggs are not plentiful use one egg and one cup sour milk with half a teaspoonful of soda.

MOCK OYSTERS.

INGREDIENTS.

½ *Cup green maize pulp.*
1 *Egg, beaten.*
Salt.

To the maize pulp, uncooked, add salt and the egg, well beaten. Drop from a teaspoon into hot fat or butter.

MAIZE MEAL RELISH.

Mix 1 cup of maize meal and ½ teaspoonful of salt with 1 cup of sweet milk, stir into 2½ cups of boiling water. Stir till it boils, then occasionally for half an hour. Add 1 egg well beaten, 1 teaspoonful butter, ¼ cup of grated cheese. Pour into shallow pan to cool. When cold cut into squares or rounds, place on a baking dish that can be sent to the table, in layers pyramidal in shape, with spaces between. Sprinkle the layers with bits of butter and grated cheese. Place in oven long enough to heat and to melt the cheese.

FANKO CHEESE SOUFFLE.

INGREDIENTS.

1 *Quart milk.*
½ *lb. Gruyère cheese.*
2 *Eggs.*

1 *Tablespoon butter.*
Fanko flour or fine maize meal.

Into the boiling milk stir fanko flour or maize meal to make the consistency of ordinary porridge. Add the cheese grated, season to taste with salt and cayenne pepper, and boil gently for 20 minutes. Take from fire; when fairly cool add eggs, whites and yolks beaten separately, and the butter. Bake in well-buttered patty pans and serve hot.

SAMP RISSOLES.

INGREDIENTS.

1 *Cup samp (or stamped maize).*
2 *Eggs.*
1 *Cup milk.*
1 *Tablespoonful butter (melted).*
1 *Teaspoonful white sugar.*

Boil the samp till quite soft, add butter and milk by degrees, beat till quite light, rub in sugar and egg. Form into rissoles, egg and bread crumb, fry in the usual way.

HOMINY* SOUFFLE.

INGREDIENTS.

1 *Pint hominy.*
1 *Teaspoonful butter.*
3 *Eggs.*
Salt and pepper.

Add to freshly cooked hominy a palatable seasoning of salt and pepper, butter, grated cheese may be added, and the yolks of eggs well beaten. Whip the whites to a stiff, dry froth, cut them lightly into the hominy and turn into a buttered pudding dish. Bake 20 minutes in a very hot oven and serve at once, as it quickly falls.

AS A VEGETABLE.

SAMP, OR STAMPED MAIZE.

The dry maize is carefully stamped or put through a coarse mill; they must be entirely free from husk and quite clean. Boil till quite soft and floury looking, serve as a vegetable with gravy or sauce. Delicious. Children are very fond of this dish served with sugar or milk.

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*Term used for finely stamped maize, and is also known as "mealie-cremo" or semola, which can be obtained from grocers. It is prepared in the same way as rice, but with more water, and it takes longer to cook. Hominy is also used for making porridge.

TO BOIL GREEN MAIZE.

Strip off the outer husks, leaving one layer; turn these back and pick off all silks; then cover the ear with the remaining husks, tie at the top, put into boiling water, and cook from 10 to 20 minutes, according to size. Cut off the stem close to the ear, which frees it from the husks, and send to the table hot. The husks may be removed before boiling, but much sweetness is lost by so doing. The maize looks cleaner and whiter when boiled in the husks. If boiled too long green maize is hardened, and the flavour is impaired.

ROAST MAIZE (for Picnics).

Turn husks back from the maize, pick off all silks, re-cover with the husks and bind with a fine wire, cover the maize with a thick bed of hot coals and ashes for half an hour. Dust off the ashes and strip off the husks. To be eaten very hot, with plenty of butter, salt and pepper, and off the cob. Maize may be roasted in the oven. It should be husked, the silks removed, the ears placed in a very hot oven till quite brown.

BROILED GREEN MAIZE.

Remove husks and silks, rub ear with butter, salt and pepper, place on a wire gridiron over bright hot coals. As soon as the maize is brown it should be laid upon a plate and a little melted butter with salt and pepper poured over each ear, and served immediately.

STEWED MAIZE.

INGREDIENTS.

6 *Ears of fresh green maize.*
1 *Oz. butter.*
1 *Oz. flour.*
¾ *Pint milk.*
Salt and pepper.

Remove the husks and silks, cut downwards through the centre of each row of grains, then remove them with the back of a knife. Place the grains in a stewpan containing sufficient boiling water to cover them, simmer gently for half an hour, and drain well. Meanwhile, heat the butter in another stewpan, add the flour, stir and cook it for a few minutes without browning, then put in the milk. Stir until boiling, season to taste, add the prepared maize, and, when thoroughly hot, serve. Sufficient for five or six persons.

FRIED MAIZE.

Ingredients.

1 *Tin of maize.**
2 *Tablespoonfuls melted butter.*
2 *Eggs.*
Salt and pepper.

Pound the maize in a mortar until quite smooth, then work in the melted butter and eggs, and season to taste. Form the mixture into small oval or round shapes, fry both sides until lightly browned, then serve. Sufficient for five or six persons. Serve with fried or roast fowl.

SUCCOTASH.

(American Indian Recipe.)

Ingredients.

10 *Ears of maize.*
1 *Cupful milk.*
1 *Tablespoonful butter.*
Lima beans, or any beans, green or dry.
Salt.
Pepper.
Soda.

Cut the maize from cobs; mix this with one-third the quantity of beans and cook for 1 hour in just enough water to cover them. Drain off most of the water; add milk, with a pinch of soda stirred in. When this boils stir in butter rubbed in flour; season with pepper and salt, and simmer for 10 minutes longer.

GREEN MAIZE PUDDING.

Ingredients.

½ *Dozen ears of maize.*
2 *Eggs.*
1 *Teaspoonful salt.*
1½ *Cups milk.*

Take the maize pulp, add eggs beaten well together, and stir in milk and salt. Bake the whole for about 2 hours in a pudding dish. Some people add a teaspoonful of sugar to the eggs in stirring them with the other ingredients. The pudding is served as a vegetable with the meat.

*American sweet or sugar corn.

BAKED GREEN MAIZE AND TOMATOES.

Ingredients.

1 *Quart of pulp.*
1 *Quart of tomatoes, peeled and sliced.*

Butter a pudding dish. Put in a layer of tomatoes with bits of butter, then a layer of maize pulp, salt and pepper; repeat till the dish is full. Cover with cracker or bread crumbs, with butter to make brown. Place in hot oven. Bake $\frac{1}{2}$ hour.

STEWED MAIZE AND TOMATOES.

Ingredients.

1 *Quart of maize pulp.*
1 *Quart of tomatoes.*
1 *Heaping tablespoonful of butter.*
1 *Saltspoonful salt.*
1 *Teaspoonful sugar (if liked).*

Let the maize pulp and the tomatoes, peeled and sliced, cook slowly for a few minutes, season, stir, and serve in hot dish. Canned corn and tomatoes may be used.

TOMATO AND MAIZE SALAD.

Pour boiling water over large smooth tomatoes to loosen the skins, and set on ice. When perfectly cool, take out the centre of each tomato with a spoon and fill the cavity with boiled maize cut from the cobs, and leave to get perfectly cool. Then serve with Mayonnaise dressing.* Arrange the tomatoes on a cold plate, lined with lettuce, and leave on ice until wanted.

CUSTARDS, BLANC-MANGE AND PUDDINGS.

MAIZE MEAL CUSTARD (BAKED).

Ingredients.

$\frac{1}{4}$ *lb. Maize meal.*
1 *Pint milk.*
2 *Eggs.*

*MAYONNAISE DRESSING.

Take the yolk of one hard-boiled egg, mash, and add salt and pepper and mustard to taste; then rub smooth with salad oil. Put in the uncooked yolk of one egg, add more oil slowly, stirring constantly until the consistency of a custard. Lastly add vinegar, enough to give a pleasant acid taste.

Salt and sugar to taste.
Butter.
Nutmeg.

Make a thin porridge, using part of milk. Thin with the rest of milk (cold), add sugar, salt and nutmeg to taste, and, lastly, eggs, well beaten. Put little lumps of butter on top, and bake in oven about 1 hour.

HOMINY BLANC-MANGE.

Ingredients.

1 *Pint milk.*
3 *Tablespoonfuls hominy.*
1 *Tablespoonful sugar.*

Let boil for about 2 hours, then pour into moulds and allow to cool.

SEMOLA BLANC-MANGE.

Ingredients.

4 *Ounces semola.*
1 *Quart milk.*
2 *Ounces sugar.*
1 *Ounce butter.*
Flavouring essence.

Stir semola into the milk, add sugar, butter and flavouring. Boil for 20 minutes, pour into a mould and leave to cool. Serve with jam or stewed fruit. One or two eggs will improve the blanc-mange.

CORN-FLOUR OR MAIZENA BLANC-MANGE.

Ingredients.

1 *Quart milk.*
4 *Tablespoonfuls corn-flour, wet with a little of the milk.*
4 *Eggs, beaten separately.*
1 *Cup sugar.*
1 *Lemon rind, grated, or lemon essence.*
1 *Saltspoonful salt.*

Scald milk in double boiler, with salt and sugar, stir in corn-flour, cook 5 or 10 minutes. Remove from fire, stir in yolks of eggs, return to fire for a few minutes, then stir in the whites and cook a few minutes more. Take from fire, cool a little, flavour, pour into a wet mould, set in a cool place for a few hours, or overnight. Turn out, serve with whipped cream around, with spoonfuls of jelly; or serve with boiled custard and jelly, or plain.

BOILED CUSTARD.

INGREDIENTS.

1 *Pint of milk, scald in double boiler.*
1 *or* 2 *Eggs, well beaten, or the yolks alone may be used.*
1 *Teaspoonful corn-flour, wet with a little cold milk.*

The corn-flour is added to the custard to prevent curdling, as it is apt to do if left to cook a few minutes too long.

CORN-FLOUR PUDDING (BAKED).

INGREDIENTS.

1 *Quart of milk, heated to boiling.*
4 *Eggs, beaten separately.*
4 *Tablespoonfuls of corn-flour, dissolved in a little of the milk.*
¾ *Cup of sugar.*
1 *Saltspoonful of cinnamon. Any flavouring may be used.*
½ *Nutmeg.*
1 *Tablespoonful butter.*

Stir the dissolved corn-flour into the boiling milk, boil 5 minutes, stirring all the time. Take from the fire, add the butter, and set to cool. Beat eggs very light, add the yolks, sugar and flavouring to the corn-flour mixture; then add whites, and beat till smooth. Turn into a buttered pudding dish and bake half an hour. Serve cold with powdered sugar.

Witwatersrand Agricultural Show.

EXTRACT FROM OFFICIAL CIRCULAR.

The Executive Committee of the Witwatersrand Agricultural Society have, after mature consideration, decided to carry out its Annual Easter Show, and the event will take place, as usual, at their Show Grounds, Milner Park, Johannesburg, commencing on Wednesday, 27th March, and ending on Monday, 1st April, 1918. The show, it will be observed, is this year to be a five days' undertaking, instead of a six days', as in the two previous years.

The Committee fully recognise the responsibilities entailed in under-

taking the carrying out, under existing economic conditions, of a full Rand Show programme, and more particularly so looking to the limited facilities which can at present be afforded by the railway authorities in the direction of reduced rates for exhibits and special fares for exhibitors and visitors, but they feel that the great educational value to the farming community particularly and to the public generally of a first-class exhibition of pure-bred stock, etc., such as that usually to be found at the Rand Show, compels them, in the interests of South African farmers generally, to carry on irrespective of the financial consequences.

Under the circumstances, therefore, it is earnestly hoped by the Committee that breeders throughout South Africa will endeavour to lend us their hearty co-operation in supporting our 1918 show, and by rallying round and giving us a helping hand they will ensure the continuation of an annual fixture which is primarily promoted for their interests, and which in the past has proved of inestimable value to large sections of the community.

The prize list is now in course of preparation, and will be issued within the next week or so, when a copy will be immediately mailed to you. It will be found therefrom that the same generous prize money which has always characterised the Rand Show programme still prevails; in fact, in the stock sections the aggregate of prize money and cups and other special prizes is the largest ever offered in the history of the Society.

Bulawayo Fat Stock Sale, 15th December, 1917.

The following are some of the prices realised:—

	Weight lbs.	Owner.	Price realised, live weight.
Fat oxen	1,280	Jobling	37s. per 100 lbs.
,,	1,220	Jobling	34s. ,,
,,	1,950	Hull	36s. ,,
,,	1,640	Hull	35s. ,,
,,	1,100	Townsend	36s. ,,

5 oxen—Mr. Fynn, 2 months stall fed, estimated dead weight 1,000 lbs., realised £20 per head.

Fat cow—B.S.A. Company, realised £22.

Note.—Hull's 2 fat oxen, 1 to 4 years old.

We understand this is the first time fat cattle have been sold by live weight in this country.

Molasses Grass.

The following memorandum was brought to our notice by Mr. H. R. Cumming, of Gwelo, and is of considerable interest in view of the success attained with molasses grass in Rhodesia. Its drought-resisting qualities have been fully demonstrated here. This feature and the fact that it matures for hay as late as May or June constitute its principal value to the Rhodesian farmer.

Royal Botanic Gardens, Kew,
5th November, 1917.

MEMORANDUM.

Subject: "Molasses Grass" (*Melinis minutiflora*).

"A sweet and highly nutritious species, and the most esteemed of the grasses of Central Brazil, where it is native, growing upon the hills and dry lands. It is regarded as a most excellent grass for dairy cows. The Brazilian names for this grass are *Capim mellado* and *Capim gordura*; the English name given above is a translation of these." (See "Economic Grasses," by F. Lamson-Scribner, U.S. Dept. of Agric., Division of Agrostology, Bull. No. 114, 1898, p. 47.) The plant is figured under the name of "Stink Grass of Brazil" in "Queensland Agricultural Journal," vol. IX., Aug., 1901, p. 215, by F. M. Bailey, who reported, "Seeds of the grass now brought under notice were received from the Agent-General, London, as a species likely to prove a valuable addition to the drought-resisting species already indigenous in Queensland. . . . The species has a vigorous habit, is very leafy, and likely to prove a good fodder grass, but as to its drought-resisting properties, and whether it will stand grazing, these have yet to be proved." This grass has also been under experiment in Dominica. (See "Agricultural News," Barbadoes, vii., 1908, p. 366, and Report, Botanic Station, Dominica, 1908-09.)

A variety—*pilosa*—occurs in Natal, Nyasaland and on Mt. Ruwenzori, and the typical form is, in addition to Brazil, recorded from tropical Africa and Madagascar.

The view held in Portuguese West Africa differs from that held in Brazil.

Welwitsch ("Cat. Afr. Pl. Welw.," ii., 199) says of it, "An ornament of the pastures, but from the viscosity of stem and leaves, a great nuisance, and disliked by cattle. Grows in dense masses in damp meadows, and also, but more rarely, in dry thickets near Sange and in the whole province of Golungo. Called *Capim melado* by the Portuguese colonists, from the stickiness of stem and leaves."

It is also known from Ascension Islands, where it grows in great quantity on the "Green Mountain" between 1,500 and 2,500 feet, but is scarce in the drier lower parts.

There is no evidence that the grass is cultivated in Brazil.

How to find the Capacity of a Dipping Tank.

CORRECTION.

The following plan for measuring a dipping tank was communicated by a correspondent and published in the *Journal* of April, 1916. An error in the figures has been discovered, and we think the safest way of rectifying it is to reprint the whole in corrected form. We would suggest to readers who have files of the *Journal* the advisability of marking page 237 of April, 1916, issue:—"Cancelled; see February, 1918."

(1) Reduce all dimensions to the same denomination, feet or inches.

(2) Add the length of the bottom of the vat to the length at the water line.

(3) Add the width of the bottom to the width at the water line.

(4) Multiply these sums (2) and (3) together.

(5) Multiply the length of the bottom by the width of the bottom.

(6) Multiply the length at the water line by the width at the water line.

(7) Add together (4), (5) and (6).

(8) Multiply this sum (7) by one-sixth the perpendicular depth from the water line to the bottom, which gives the capacity of the tank in cubic feet or cubic inches—naturally depends on the denomination; see (1).

(9) If the capacity in cubic inches has been obtained, divide (8) by 276; if the capacity in cubic feet has been obtained, divide (8) by 0.16. In either case the result will be the capacity of the vat in gallons.

If the tank is level, the above method is mathematically accurate, but if it is set so that it is slightly lower at one end than the other, as is usual, the true capacity cannot be obtained by this method. If, however, the figures for the width at the water line and the depth are taken from measurements at the *middle* of the tank, the results obtained will vary only very slightly from the actual capacity.

Below we give an extract from the Departmental bulletin on the construction of dipping tanks, which explains the most simple and reliable method of measuring the capacity of a tank.

The following schedule gives the approximate capacities of a tank built strictly to the specification given in the bulletin, but as it is only in very rare instances that tanks are built exactly to these dimensions, it should serve as a guide only, and is not to be relied upon when mixing the dip. The only accurate method of ascertaining the capacity of any dipping tank is by means of introducing the dip (or water)

from a smaller tank (or buckets) of known dimensions. A tank of, say, 100 gallons capacity could be erected in such a position that its contents can be emptied into the dipping tank. The level attained by each emptying, which in this case is equivalent to 100 gallons, can then be indelibly marked on the side of the tank or on a gauge post placed in the tank.

Depth.			Depth.		
Ft.	In.	Gallons.	Ft.	In.	Gallons.
0	0	0	4	$0\frac{3}{4}$	1,600
0	$4\frac{3}{4}$	100	4	$2\frac{3}{4}$	1,700
0	9	200	4	$4\frac{3}{4}$	1,800
1	$0\frac{3}{4}$	300	4	$6\frac{1}{2}$	1,900
1	$4\frac{1}{2}$	400	4	$8\frac{1}{4}$	2,000
1	8	500	4	10	2,100
1	$11\frac{1}{2}$	600	4	$11\frac{1}{2}$	2,200
2	$2\frac{1}{2}$	700	5	1	2,300
2	$5\frac{1}{2}$	800	5	$2\frac{1}{2}$	2,400
2	$8\frac{1}{2}$	900	5	4	2,500
2	$11\frac{1}{4}$	1,000	5	$5\frac{1}{2}$	2,600
3	$1\frac{3}{4}$	1,100	5	7	2,700
3	4	1,200	5	$8\frac{1}{2}$	2,800
3	$6\frac{1}{4}$	1,300	5	10	2,900
3	$8\frac{1}{2}$	1,400	5	$11\frac{1}{2}$	3,000
3	$10\frac{3}{4}$	1,500	6	0	3,060

Departmental Correspondence.

Under this heading we publish correspondence between farmers and the technical officers attached to the Department of Agriculture, containing information which may be of interest and assistance to our readers.

POULTRY DISEASE.

A correspondent sends the following enquiry:—"Our fowls become droopy, and after a few days some of them die. Sometimes the liver is affected. Can you suggest a remedy?"

To this Mr. F. Sheppard replies:—"The fowls are most probably suffering from pneumonia. This is far more frequent than is supposed

amongst poultry during the wet season, specially if the birds are not well housed. The disease frequently develops so rapidly that it is practically impossible to cure. Shut the ailing bird up in a warm place, close to a fire, if possible, give one grain quinine and a dose of Epsom salts. A few drops of brandy in milk at frequent intervals is also useful. Give a grain of quinine each day only. The bird will probably start to improve after the first day or two. Then discontinue the quinine and salts, and give good nourishing food containing finely chopped up onions and a little raw meat, but continue to keep the bird warm. Supply, of course, drinking water, with, if possible, a drop or two of spirits of camphor in it. To prevent further cases, provide all the birds with proper shelter from damp and bad weather, and give plenty of chopped up onions in soft food during the wet weather, specially on very wet days."

The Agricultural Outlook.

With the exception of a few cases of "stiff-sickness" reported, accounts received shew that live stock generally is in good condition.

With regard to crops, reports from all districts agree in stating that the prolonged rain and lack of sunshine have had an unfavourable effect upon crops. In many cases ploughing was completely stopped; in others, although the land was ready for sowing, it was impossible to work the planters, so that planting was postponed until unduly late or prevented altogether. Even where farmers had succeeded in getting their seed in early, the continuous heavy rain has greatly hindered cultivation and hand weeding, the result being that considerable areas of maize, more particularly vlei lands, have been lost through the excessive growth of weeds. On other lands the crops are stunted and unhealthy through water-logging, while in some valleys slices of good agricultural land have been completely carried away by floods. The outlook is not good, and there is little prospect of recovery, as the abnormal rains have continued till long after the latest possible planting date for maize.

Veterinary Report.

November, 1917.

AFRICAN COAST FEVER.

Salisbury District.—One beast destroyed on the infected farm Highfield.

Umtali District.—Three head destroyed on the infected farm Engwa.

Victoria District.—An extension of infection appeared on the Msari reserve a few miles from the original centre of infection on the farm Lounton; 18 head were destroyed. At the infected farm Erichsthal the mortality was one beast, and on the infected section of Victoria commonage one head also.

QUARTER-EVIL.

The following mortality in cattle was reported:—Bulawayo, 1; Matobo, 2; Inyati, 12; Insiza, 2; Plumtree, 11.

MALLEIN TEST.

The following animals were tested on importation, with negative results:—Horses, 7; mules, 5; donkeys, 20.

IMPORTATIONS.

Heifers, 94; bulls, 25; horses, 7; mules, 5; donkeys, 20; sheep and goats, 1,756.

EXPORTATIONS.

Slaughter oxen to Johannesburg *via* Bulawayo, 596; *via* Liebig's Drift, 571. To the Union:—Horses, 5; mules, 6; sheep and goats, 752; pigs, 32. To Northern Rhodesia and Congo Belge:—Sheep and goats, 225; donkeys, 18.

December, 1917.

AFRICAN COAST FEVER.

Umtali District.—Two animals were destroyed on the infected farm Engwa.

Victoria District.—The disease appeared on the farms Beza and Arawe, both within a few miles of the original centre of infection. On the former 194 head of cattle are involved, and on the latter 812. Mortality:—Beza, 5; Arawe, 4; Glenlivet, 2; Erichsthal, 7; Midwaters, 9; Victoria commonage, 6. District Veterinary Surgeon Sharpe was placed in charge of operations in Victoria district on his return from rinderpest duty in East Africa. He reports that the heavy rains have disorganised dipping, cattle being unable to cross swollen rivers, and tanks being flooded out with storm water. Owing to the increase of ticks, ear and tail dressing have been resorted to weekly on the infected farms.

QUARTER-EVIL.

The following mortality in cattle was reported:—Bulawayo, 2; Matobo, 7; Plumtree, 6; Inyati, 6; Gwanda, 5; Marula, 1; total, 27 head.

TUBERCULIN TEST.

One bull tested on importation, with negative results.

MALLEIN TEST.

The following animals were tested on importation, with negative results:—Horses, 4; donkeys, 4.

IMPORTATIONS.

Bulls, 13 (1 *ex* United Kingdom); horses, 4; heifers, 7; donkeys, 4; sheep and goats, 2,150.

EXPORTATIONS.

Slaughter oxen to Union *via* Bulawayo, 162; *via* Liebig's Drift, 94; total exported during 1917, 13,221. Sheep and goats to Congo, 225. Sheep and goats to Northern Rhodesia, 75. Sheep and goats to Union, 75. Pigs to Union, 83.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

February.

BEE-KEEPING.

In some districts a second flow of honey may be looked for from the veld flowers and late growing crops. Honey being secured in either sections or shallow frames should not be permitted to remain too long on the hive at this time of year, as it will become soiled with the bees' feet. Robbers may be anticipated, and this is a sign that the honey flow is nearly over. Where stocks are short of food, feed rapidly inside the hive; excellent feeders can be supplied by appliance dealers. Queenless stocks can now be re-queened, or two stocks can readily be united by previously dusting each lot with household flour. Grade and dispose of honey. It may be advantageous to reserve the choicest specimens for exhibition and competition at our forthcoming agricultural shows.

CITRUS FRUITS.

The notes on planting still apply, if trees are still planted this month, an operation which, however, it is not desirable to leave so late. Trees planted after about the end of January may only get established when it is too late that season for them to commence growth, the consequence being that what growth there is is still sappy at the approach of the cold weather and so stands a chance of being nipped. In such case the tree would have been better left in the nursery row to be lifted and transplanted into the orchard the following spring.

By the end of February or early March the cover crop should be ready to plough into the orchard, with the possibility of sufficient rains after it is done to assist in rotting the plants in the soil. A continuous watch should be kept for insect pests, and fumigation or spraying undertaken immediately any pest is observed. If no cover crop has been sown, the orchard should be kept in a good state of cultivation, and not allowed to be overrun with grass and weeds. Destroy all fruit infested with Natal codling moth by burning or burying deeply. Some success has been obtained by smearing the first oranges that begin to turn colour with tanglefoot, as these are the first fruits to be attacked by the pest. Do not allow the fruit to fall to the ground before destroying it, but pick all affected fruit as soon as it is observed.

CROPS.

During this month the farmer's energies will be concentrated on keeping the lands thoroughly clean, and if this is done effectively now, no further serious damage from weeds need be feared. Most summer crops will be in the ground. Maize for ensilage may still be sown, also catch crops of buckwheat and teff for hay and seed. The main maize crop should be cleared of suckers, which can be fed to stock. The most vigorous plants should be marked for seed selection by cutting the stalk above the cob, and the date of tasselling should be noted both in the main crop and the ensilage crop. In case of excessive moisture, the use of the wing shovel plough is strongly recommended. Monkey nuts should not be cultivated after the period of flowering, which is usually early in February. Hay-making should start in February if weather conditions allow. The sooner the veld is cut for hay the better the product obtained. Land for winter crops of oats and wheat

should now be got ready as weather conditions permit. Napier's fodder slips planted early in the season can now be divided. Potatoes are sometimes planted this month in order to obtain seed for the early plantings the following season.

DECIDUOUS FRUITS.

This is the time to carry out summer pruning, after harvesting the crop, and when the flow of sap begins to become sluggish.

ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down (see March). Certain caterpillars are sometimes troublesome. See "Some Insect Pests of Maize," *Agricultural Journal*, June, 1912, and "Some Injurious Caterpillars," *Agricultural Journal*, February, 1915.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. See "Handbook of Tobacco Culture," published by the Department of Agriculture, pp. 71-99.

Potato.—Ladybirds and tuber moth may call for attention; the latter, when very bad, sometimes causes considerable wilting of the crop besides attacking the tubers. See *Agricultural Journal*, October, 1913, and February, 1910.

Cabbage Family.—All members of the family are liable to the attack of sawfly and webworm during February. See *Agricultural Journal*, February, 1914; April, 1910; and April, 1911.

Beans and Cowpeas.—These suffer chiefly from stem maggot and blister beetles, which destroy the blossoms. The latter must be collected by hand. The former is dealt with in the number of this *Journal* for April, 1913.

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. At present no remedy is known except collecting and destroying the infested fruit early in the season. Aphis on the leaves and shoots may be destroyed by careful spraying with tobacco and soap wash or paraffin emulsion.

Mangolds and Beets.—These are frequently defoliated by caterpillars. Spray with an arsenical wash.

Citrus Trees.—The chief pest requiring attention during February is citrus codling. The infested fruit should be gathered and destroyed regularly. The fruit is also apt to be attacked by large fruit-piercing moths, for which unfortunately no remedy is known.

Deciduous Trees.—Apple, pear and late peaches suffer chiefly from fruit moths which puncture the fruit. No remedy is known except netting the trees.

Fig.—The fruit is liable to the attack of fig weevil. Infested fruit and all wild figs near the trees should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon disulphide into the burrow and sealing it up.

Castor Oil.—Two-year-old plants which contain borer should be cut down and burnt. See *Agricultural Journal*, October, 1912.

FLOWER GARDEN.

During this month the flower garden is gradually approaching perfection, and nearly all plants are in bloom. If these are constantly plucked the yield will be increased, and except where required for seed, all flowers should be removed as they fade, for seeding shortens the life of many plants. All runners and creepers should have constant attention, and be tied up and trained. Dahlias in more exposed positions should be carefully tied

to their stakes, as they now become top heavy with the weight of their blooms. Palms in the house and conservatory will benefit much if occasionally put out in the rain.

FORESTRY.

Complete planting out of ever-greens. Sow in nursery seeds of slow growing species such as cypress, pines, etc. All planting should be completed this month, in the early part if possible.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

Do not attempt to make your birds lay during the moult, and, if possible, keep them dry. As the feathers are being cast, food of a cooling rather than a stimulating nature should be given. Do not have any superfluous fat on your moulting birds, or they will probably stick in the moult. Give all birds a plentiful supply of green food. Keep your late hatched birds growing as long as possible. The early hatched pullets should be giving a good supply of eggs now. Do not forget the dust bath.

STOCK.

Cattle.—Grass will now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little crushed and soaked mealies, or something similar, may still be given at milking, if only to bring the cows quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose and move to fresh grazing and kraals.

TOBACCO.

The curing should be well on now, if any tobacco was transplanted in November. This will be a busy season until the curing is finished; however, one or two good plough boys with all the spare oxen should be breaking land for the next season's crop, turning under all vegetable matter.

VEGETABLE GARDEN.

Potatoes should receive attention and be carefully ridged up, and care taken that the stalks are not buried. Seeds for winter crops should be sown, such as beet, Brussels sprouts, cabbage, carrots, beans, peas, onions, turnips, tomatoes, etc. Vegetables planted out during this month might be placed a little closer together than usual, as watering may have to be resorted to before they mature.

VETERINARY.

This is a bad month for horsesickness. Redwater and gallsickness in cattle occur all the year round, but the summer months, when ticks are active, is the worst time. Three-day sickness in cattle may now be looked for. Trypanosomiasis is a summer disease. Blue tongue is somewhat similar to horsesickness, and February is a bad month. The disease has so far only been found in imported merinos, but it spreads from these to indigenous sheep. After twelve months in the Territory, sheep do not contract the disease. The first symptom is laminitis, the second a protruding blue tongue. White scour may be prevalent now, but dipping is eradicating the disease.

WEATHER.

This is generally the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

March.

BEE-KEEPING.

Be on the look-out for damage to stocks by the wax moth; strong stocks generally tend to obviate this pest. Where the heavy rains have penetrated the weak hive roofs and caused dampness among the quilts, these should be taken off and thoroughly dried in the sun, then replace. Contract the entrances of hives to prevent robbing. Unsold honey should be stored in a warm dry cupboard. Keep apiary clear of weeds.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring.

CROPS.

For general cultural treatment, see February notes. Rape and kale for autumn feeding may be sown during the latter half of this month. Haymaking can continue. Land for winter crops of oats and wheat should now be ready. The division of Napier's fodder slips can be continued up to the end of this month. Buckwheat, linseed, teff grass and manna will be ready for reaping this month. The silo pit should now be got ready. Maize will be ready for ensilage in four to five weeks after the period of tasselling.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood will be found freely in the stalks, but nothing can be done at this stage. Caterpillars may attack the

crop during this month, usually *as a sequence to cultivation after the weeds have been allowed to get too far ahead.* The caterpillars attack the crops on account of their food being suddenly destroyed. See "Some Insect Pests of Maize," *Agricultural Journal*, June, 1912; and "Some Injurious Caterpillars," *Agricultural Journal*, February, 1915.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but any plants still infested with stem borer should be removed and burned. Leaf miner will still be in evidence, and budworms may put in an appearance. See "Handbook of Tobacco Culture," published by the Agricultural Department, pp. 71-90.

Potato.—Ladybirds may still be injurious. See *Agricultural Journal*, October, 1913. Careful hilling should be attended to on account of the tuber moth. See *Agricultural Journal*, February, 1910.

Cabbage Family.—Sawfly. See *Agricultural Journal*, April, 1910; and April, 1911. The fly will probably be less injurious by this time. Cabbage louse may be on the increase. Very thorough spraying with tobacco wash and soap is of value when the plants are young.

Beans and Cowpeas.—The most obvious enemies are the blister beetles, which destroy the blossoms. These can only be destroyed by hand. Stem maggot continues injurious, causing dropping of leaves on the larger plants, but little can be done at this stage.

Melon Family.—Plants of this family are subject to the attack of melon fly and aphis. Careful spraying with tobacco wash or paraffin emulsion is of value against the latter.

Sweet Potato.—Hawk moth caterpillars occasionally appear in countless thousands and defoliate the crop. Immediate spraying with an arsenical wash is called for when the insects first appear. See *Agricultural Journal*, June, 1912.

Citrus Trees.—Attention should constantly be given to the systematic collection and destruction of infested fruit to keep down the citrus codling. Large fruit-piercing moths may attack the fruit during the month (see under February).

Deciduous Trees.—But little damage from insects is likely to occur to these fruits during March.

Fig.—Fig weevil still calls for attention in collecting and destroying the infested fruit.

Castor Oil.—See under February.

FLOWER GARDEN.

During this month the garden should be seen at its perfection, and, owing to our rains, requires a great deal of attention in order to keep the soil free from weeds and caking. Drainage should also be looked to, in order to avoid plants being swamped or washed away. Dahlias and carnations should now be in their heaviest bloom, and will require tying up, and the dying blooms should be removed, in order to prolong their flowering period. Plants for winter flowering should now be coming on and planted out. Cuttings of carnations may now be made, and should be picked from the choicest plants, and taken from stems which have borne the finest blooms. The cuttings should be placed in boxes containing sand, and kept in a moist condition in a warm position sheltered from the winds. These should be ready for planting out in about two months, and bloom in three. Carnations, verbena, antirrhinum, penstemon, pansy, dianthus, phlox, calliopsis and escholtzia may be sown for early blooming next spring.

FORESTRY.

If necessary, cultivate between the rows of trees planted out in the previous months. Plough any fire lines that are necessary and break up any new ground that will be required for next season's planting. Remember

that the roots of trees penetrate deeply into the ground, and therefore plough as deeply as possible. Where black wattle thrives, sow seed this month, after well soaking.

GENERAL.

At this time the condition of stock on the veld is good—perhaps at their best. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

An iron tonic will be found beneficial to any birds that are not moulting satisfactorily. If the new feathers are forming, give a little increase in food containing some animal matter. Flowers of sulphur in the soft food will help to keep the birds in condition. Continue to give abundance of green food. Keep an eye on the birds which have made the best progress in the moult with a view to early mating.

STOCK.

Cattle.—The precautions recommended for February apply equally to March. Weather permitting, no opportunity should be lost of getting in good, sweet hay before grass is too old. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

TOBACCO.

The tobacco set out about Christmas time should be coming to maturity now, and the crop, if early and a good one, should be all reaped by the end of April.

VEGETABLE GARDEN.

Tomatoes, peas and beans should be in full bearing, and should be staked and tied. Weeding and cultivation should be extensively carried out. Seeds for late winter crops—beans, cabbage, cauliflower, peas, radish, turnips, spinach and beet—should be sown.

VETERINARY.

Horsesickness is now prevalent. Redwater and gallsickness occur in cattle all the year round, but the worst time is the summer, when ticks are numerous. Trypanosomiasis is a summer disease. Blue tongue may now be expected.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY.

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1917	November	8·40	0·45	0·02	0·28
1917	December	5·27	0·29	0·02	0·17

TEMPERATURES.

Station	November		December	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	85·0	53·8	79·1	53·0
Hartley—				
Gatooma	91·0	—	81·1	63·2
Hallingbury Farm	83·1	62·8	78·7	63·1
Hartley Hospital	88·7	62·8	80·1	63·0
Idaho Farm	88·9	59·7	79·7	60·1
Lomagundi—				
Eldorado Mine	—	—	75·1	62·9
Sinoia	89·9	70·0	82·2	71·4
Sipolilo	87·6	63·2	—	—
Mangwendi—				
Kwenda Hospital	—	—	—	—
Mazoe—				
Shamva Mine	88·6	66·2	79·6	64·3
Melsetter—				
Melsetter	78·0	58·4	72·8	56·7
Mount Selinda	79·8	61·8	74·0	61·1
Vermont	83·5	61·1	74·6	61·2
Salisbury—				
Chishawasha	83·9	61·1	75·9	61·1
Salisbury (Gaol)	85·4	56·8	—	—
Umtali—				
Public School	—	—	—	—
Summerfield	—	—	—	—
Victoria—				
Eythorne	88·5	59·5	87·0	59·3
Morgenster	—	—	—	—
Victoria	83·4	62·7	76·9	62·2

TEMPERATURES—*(Continued).*

Station	November		December	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	90·1	62·5	80·3	61·7
Garth	89·8	64·1	79·4	60·6
Plumtree Schoo	—	—	—	—
Retreat	93·4	64·0	86·1	61·8
Bulawayo—				
Observatory	84·5	61·2	—	—
Gwanda—				
Antelope Mine	88·3	65·6	81·6	63·0
Mazunga	—	—	—	—
Tuli	93·2	67·9	—	—
Gwelo—				
Gwelo	—	—	—	—
Gwelo (Gaol)	84·0	59·0	75·9	58·4
Matobo—				
Holly's Hope	89·4	63·8	80·8	63·2
Rhodes Matopo Park ...	89·7	60·7	79·3	59·5
Umzingwane—				
Essexvale	87·4	63·9	76·9	63·1
Hope Fountain	85·3	55·7	74·3	59·0
Wankie—				
Victoria Falls	87·9	68·5	—	—
Wankie (Hospital)	93·1	71·6	—	—

RAINFALL.

Station	November	December
MASHONALAND—		
Charter—		
Buhera	7·13	19·38
Bushy Park	4·08	17·27
Enkeldoorn Gaol	4·17	13·54
Marshbrook	3·30	19·85
Range	5·35	14·66
Riversdale	2·88	13·83
Umniati	4·80	14·05
Vrede	5·72	13·85
Wylde Grove	4·33	—
Chibi—		
Chibi	5·74	11·88
Nuanetsi Ranche	1·96	4·91
Chilimanzi—		
Central Estates	5·70	14·79
Chilimanzi	4·13	14·73
Driefontein	3·72	18·85
Induna Farm	4·70	12·26

RAINFALL—*(Continued).*

Station	November	December
Mashonaland—(Continued)		
Chilimanzi—continued		
Orton's Drift	3·70	16·75
Umvuma (Railway)	7·27	—
Darwin—		
Mount Darwin	11·70	12·04
Gutu—		
Chingombe	5·39	8·50
Eagle's Nest Ranche	4·09	19·09
Gokomere	5·00	15·59
Gutu	1·40	11·00
Hartley—		
Ardgowan	4·76	14·16
Auchter Leny	5·79	16·73
Battlefields (Railway)	5·19	—
Carnock Farm	5·15	12·52
Elephant Hill, Battlefields	—	—
Elvington	4·83	13·73
Gadzema (Railway)	6·92	—
Garthnor	—	—
Gatooma	4·72	12·46
Gatooma (Railway)	3·86	14·05
Gowerlands	3·68	7·19
Hallingbury Farm	8·35	7·32
Hartley Hospital	6·07	8·52
Hartley (Railway)	5·09	—
Hopewell	4·38	—
Idaho Farm	6·02	11·42
"Jenkinstown"	4·73	—
Makwiro (Railway)	5·16	—
Philiphaugh	4·76	9·65
Shagari	4·21	10·61
Spitzkop	5·39	15·41
Inyanga—		
Inyanga	5·66	14·72
Rhodes Estate	10·87	16·03
St. Trias' Hill	6·24	12·12
Lomagundi—		
Argyle	5·76	—
Banket Junction (Railway)	5·12	—
Darwendale	4·71	14·09
Duxbury Farm	6·86	7·52
Eldorado Mine	4·90	9·19
Eldorado (Railway)	4·44	—
Lion's Den	—	—
Lone Cow Estate	5·12	8·99
Longmead	5·33	9·63
Maningwa	6·03	9·66
Mikore	7·19	10·33
Mukwe River Ranche...	—	9·32
Palm Tree Farm	5·67	10·04
Sinoia	5·08	6·68
Sinoia (Railway)	4·08	6·02
Sipolilo	5·15	—
Umvukwe Ranche	3·02	—

RAINFALL—(*Continued*).

Station	November	December
MASHONALAND—(Continued)		
Makoni—		
Carlow Farm	6·55	12·70
Chimbi Source	5·65	11·56
Delta	4·40	21·48
Eagle's Nest	10·34	14·20
Ellavale	6·06	8·65
Gorubi Springs	6 39	13·22
Headlands (Railway)	5·37	—
Mona	6·57	13·61
Monte Cassino Mission	8·34	15·13
Odzi (Railway)	5·50	11·41
Rusape (Railway)	4·35	—
Springs	5·94	16·57
York Farm	11·80	16·59
Marandellas—		
Bonongwe...	3·57	15·50
Huish Estate	3·86	19·09
Kwenda Hospital	—	—
Land Settlement Farm	3·89	19·42
Macheke (Railway)	9·90	16·67
Marandellas	—	—
Marandellas (Railway)	5·03	—
Nelson	2·22	21·03
Selous Nek	11·60	16·20
Theydon	6·94	18·69
Tweedjan	5·56	16·95
Verdoy	3·25	13·71
Mazoe—		
Avonduur	5·20	7·05
Bindura	7·30	12·23
Bindura (Railway)	7·75	14·16
Ceres	9·67	12·83
Chipoli	11·99	13·07
Citrus Estate	2·50	11·53
Craigengower	—	13·01
Dunmaglas	4·42	12·05
Glendale (Railway)	2·67	—
Kilmer	3·14	13·34
Kingston	8·70	12·81
Laguaha	1·95	12·75
Lowdale	8·27	9·59
Mazoe	3·29	8·58
Mazoe (Railway)	2·57	—
Mguta Valley	—	—
Omeath	4·42	8·38
Protea Farm	—	—
Ruia	5·18	9·27
Ruoko Ranche	—	8·65
Shamva	8·27	14·96
,, Mine	10·15	16·20
Stanley Kop	5·04	11·07
Sunnyside	5·28	—
Teign	3·15	12·37
Virginia	4·80	8·80
Volynia Ranche	2·06	13·05

RAINFALL *(Continued).*

Station	November	December
MASHONALAND—(Continued)		
Mrewa—		
Glen Somerset	7·40	14·00
Mrewa	10·90	—
Mtoko—		
Makaha	8·57	16·09
Mtoko	10·35	12·64
Melsetter—		
Brackenburg	7·36	22·69
Chikore	9·59	11·31
Chipinga	6·38	15·30
Helvetia	5·14	18·05
Melsetter	9·16	14·75
Mount Selinda	8·10	21·23
Mutambara Mission	6·54	13·51
Pasture	6·99	9·52
Tom's Hope	9·00	14·64
Vermont	7·48	23·17
Ndanga—		
Bikita	8·10	19·45
Chiredzi Ranche	3·03	—
Marah Ranche	3·86	—
Ndanga	3·19	21·81
Pamushana	5·90	10·77
Salisbury—		
Ardbennie	4·35	—
Avondale	4·11	11·34
Botanical Experiment Station	5·58	8·94
Bromley	2·26	14·09
Brookmead	1·83	17·31
Borrowdale (Hatcliffe)	7·26	11·23
Chishawasha	5·75	13·67
Cleveland Reservoir	4·24	10·20
Ewanrigg	7·34	—
Forest Nursery	—	—
Glenara	8·75	8·33
Goromonzi	3·46	13·06
Gwebi	4·77	8·66
Hillside	4·41	7·77
Lilfordia	3·63	—
Salisbury (Gaol)	—	—
,, (Railway)	4·94	8·63
Sebastopol	5·54	10·12
Selby	7·44	9 94
Stapleford	6·79	11·85
Sunnyside	5·62	—
The Meadows	5·99	12·20
Vamona	5·86	8·58
Westridge	4·08	—
Umtali—		
Odzani	4·62	14·62
Penhalonga	4·80	16·24
Premier Estate	4·98	14·55
Public School	—	—

RAINFALL *(Continued).*

Station	November	December
MASHONALAND—(Continued)		
Umtali—continued		
Sarum	—	—
Stralsrund	3·45	13·99
Summerfield	—	—
Umtali (Railway)	13·32	—
Utopia	6·43	16·40
Urungwe—		
Nassau Estate	4·29	—
Victoria—		
Brucehame	2·98	11·03
Clipsham	3·88	11·49
Empress Mine	5·70	15·54
Eythorne	4·80	9·33
Fairburn	4·71	10·84
Fort Victoria (Railway)	4·98	—
Marthadale	—	—
Makorsi River Ranche	2·80	15·13
Morgenster	—	—
Silver Oaks	3·48	11·75
Victoria	4·38	12·50
MATABELELAND :		
Belingwe—		
Tamba	2·06	4·15
Wedza	1·94	6·02
Bubi—		
Bembesi (Railway)	2·97	—
Imbesu Kraal	2·77	11·04
Inyati	3·32	10·91
Maxim Hill	2·03	10·50
Shangani Estates	2·13	13·89
Bulalima-Mangwe—		
Empandeni	4·22	8·57
Garth	7·01	12·69
Mholi (late Magot)	5·27	14·56
Plumtree School	—	—
Retreat	4·06	12·45
Riverbank Farm	2·53	9·99
Solusi Mission	3·21	13·46
Syringa	6·30	15·79
Tjankwa	8·09	13·57
Tjompanie	4·82	12·80
Bulawayo—		
Government House	—	—
Keendale	2·36	9·61
Khami	2·34	11·83
Lower Rangemore	1·86	10·39
Observatory	2·05	—
Raylton (Railway)	2·70	—
Umgusa	3·09	14·19
Umkien	—	—
Gwanda—		
Antelope Mine	4·21	7·21
Gwanda (Gaol)	1·66	12·56

RAINFALL *(Continued)*

Station	November	December
MATABELELAND—(Continued)		
Gwanda—continued		
Gwanda (Railway)	1·99	—
Lamulas	2·54	3·19
Langalanga	1·45	3·83
Makalali	1·58	2·80
Manantji	1·79	6·59
Mapande	1·18	3·83
Mazunga	1·93	7·18
Mtshabzi Mission	2·14	12·34
Tuli	1·89	—
West Nicholson (Railway)	1·15	—
Gwelo—		
Daisyfield	2·47	—
Dawn	5·02	8·46
Globe and Phœnix Mine	4·39	15·22
Globe and Phœnix (Railway)	4·46	—
Gwelo (Gaol)	4·24	11·19
Gwelo (Railway)	4·32	—
Hunter's Road	5·26	13·57
Lalapanzi (Railway)	8·31	12·54
Lovers' Walk	4·34	10·75
Lower Gwelo	4·93	16·94
Oaklands	4·83	14·26
Rhodesdale Estate	6·73	13·07
Sikombela Farm	3·32	10·87
Woodendhove	4·32	13·97
Insiza—		
Albany	2·77	11·76
Filabusi	2·50	9·68
Fort Rixon	1·36	15·03
Infiningwe	1·96	7·96
Insiza (Railway)	3·04	—
Inyezi Farm	2·25	11·01
Orangevale	2·89	11·38
Roodeheuvel	5·85	15·95
Shangani (Railway)	2·83	—
Thornville	3·91	13·22
Matobo—		
Holly's Hope	2·49	5·32
Matopo Mission	1·76	11·69
Rhodes Matopo Park	2·60	12·12
Nyamandhlovu—		
Gwaai (Railway)	1·23	—
Edwaleni	4·24	10·96
Impondemi	—	13·69
Melinakanda Junction	2·55	—
Naseby Farm	1·76	12·53
Nyamandhlovu (Railway)	3·38	—

RAINFALL *(Continued).*

Station	November	December
MATABELELAND—(Continued)		
Sebungwe—		
Gokwe	3·96	11·06
Inyoka	4·39	—
Selukwe—		
Hillingdon	5·32	13·39
Selukwe (Railway)	5·22	17·95
Tokwe River Ranche	—	—
Tokwe Section	2·91	10·83
Umzingwane—		
Balla Balla (Railway)	1·70	—
Crombie's	2·36	12·69
Essexvale	1·56	12·37
Heany Junction (Railway)	2·69	13·68
Hope Fountain	1·46	—
Springs Farm	2·81	13·63
Wankie—		
Bombusi	—	—
Dett (Railway)	2·04	—
Malindi (Railway)	—	—
Victoria Falls	2·21	—
Victoria Falls (Railway)	2·08	—
Wankie Hospital	2·53	—
Wankie (Railway)	3·56	—

— No return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1918		
			February	March	April
Beatrice Road	Various farmhouses	H. W. Harris	13	13	10
Bembesi	Queen's Mine Hotel	V. C. Andrews	1	1	5
Bindura	Bindura	C. J. Glen	9	9	13
Bromley	Bromley	A. A. Draper	7	7	4
Charter—Mgezi	Beatrice Mine	W. Krienke	27	27	24
Central	Umvuma	— James	23	30	27
Eastern Border (South Melsetter)	Helvetia	J. T. Jollie	8	8	12
Enterprise	Arcturus Hotel	J. G. M. Bernard	6	6	3
Felixburg—Gutu	Felixburg	R. H. Brown	..	9	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	2	..	6
Gatooma	Gatooma	T. J. Golding	16	16	20
Gazaland	Chipinga	W. Wood	23	30	27
Greystone	Various farm houses, Shangani	M. Kerr	9	9	13
Hartley	Hartley	J. de L. Nimmo	23	30	27
Headlands	Headlands	J. M. Harvard	23	..	27
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	9	9	13
Insiza—Shangani	Shangani	T. E. Penny	..	2	..
Inyanga	Farm Cheshire	F. W. Thiel	23	30	27
Inyazura	Inyazura	A. C. Curling	20	20	17
Iron Mine Hill	Iron Mine Hill	T. Irving	9	9	13
Lalapansi	Lalapansi	N. A. Bradford	16	16	20
Lomagundi	Sinoia	A. H. Layard	16	16	20
Lydiate	Norton	W. Wrench	23	30	27
Macheke	Macheke	J. Cheyne	No fixed dates		
Makwiro	Makwiro	C. D. Voigt	15	15	19
Marandella and Mangwendi	Marandellas Farmers' Hall	A. Nicholson	2	2	6
Makoni	Rusape	H. Barnes Pope	2	2	6
Makoni North	Makoni North	----------	23	30	27
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	6	6	3
Matopo Branch, R.L. and F.A.	Sibali	----------	..	13	..
Mazoe	Glendale Siding	A. G. McCall	13	13	10
Melsetter (North)	Various farms	N. N. Rutherfurd	..	2	..
Midlands	Gwelo	A. Cox, Box 93, Gwelo	8	8	12
Northern Umtali	Farm Summerfield	R. O. H. Blurton	2	..	..
Norton and District	Norton Store	H. Grimmer	2	2	6
Que Que	Que Que	E. J. Ross	16	16	20
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	22	29	26
Shamva	Shamva	Wm. Scott	..	20	..
Selukwe	Selukwe	F. S. Clark	No fixed dates		
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	9	..
Umvukwe	Various ranches	H. K. Bracewell	..	..	..
Umtali	Christmas Pass Hotel	J. S. Holland	2	2	6
Victoria	Victoria	John Rennie	1	1	5
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	9	9	13

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Farm Seeds

The undermentioned seeds grown on the Government Experiment Farms are offered for sale at the prices stated. The amounts available are limited.

The prices quoted are f.o.r. Salisbury, or, when available, from the Gwebi Experiment Farm. The distribution of seed will commence from the 1st September, except in the case of Napier's fodder, which will be distributed from the 1st December only. Napier's fodder will be sold in bags containing approximately 200 roots, but no guarantee can be given of the exact number contained in each bag.

On account of the limited supply available in some cases, it is impossible to guarantee the full delivery of any order. *Farmers are therefore requested not to enclose cheques until they are advised as to the amount of seed allotted to them.* The seeds are consigned carriage forward in the case of stations. In the case of sidings the amount of railage will be notified after despatch.

All orders for seed must be addressed to the Government Agriculturist, Department of Agriculture, Salisbury.

1. Boer manna seed, 3d. per lb.
2. Buckwheat (Japanese), 10s. per 100 lbs.
3. Castor oil beans, 2d. per lb., 15s. per 100 lbs.
4. Dhal (ordinary), 2d. per lb., 15s. per 100 lbs.
5. Sudan grass seed, 2s. 6d. per lb.
6. Sunflower (black seeded), 2d. per lb., 15s. per 100 lbs.
7. Napier's fodder roots, 5s. per bag containing approximately 200 roots.

Forest Nursery—Sale of Trees

A list of the trees and shrubs available for sale, with prices, may be obtained on applying to the Assistant Agriculturist, Salisbury.

Services of Government Veterinary Surgeons

1. The services of Government Veterinary Surgeons are available to the public, free of charge, for the following purposes only:—

(1) Attending and giving professional advice in connection with the following diseases, viz.:—Anthrax, Contagious Abortion, East Coast Fever, Epizootic Lymphangitis, Foot and Mouth Disease, Farcy, Foot-rot, Heartwater, Glanders, Intestinal Parasites amongst sheep and goats, Liver Disease, Lungsickness, Osteo Porosis, Malarial Catarrhal Fever (blue tongue), Rabies, Rinderpest, Scabies, Sponziekte (quarter-evil), Swine Fever, and any other diseases which may in future be scheduled in terms of section 3, sub-section 18 of the "Animals Diseases Consolidation Ordinance, 1906." Attending to cases of disease amongst live stock which, though not of a contagious or infectious character, may be of general public importance.

(2) Applying tests in regard to Glanders, Tuberculosis, or any other disease against the introduction or spread of which tests are applied under regulations.

(3) Inoculations against the following diseases:—
Horsesickness, Lungsickness, Anthrax, Quarter-evil, Redwater, Malarial Catarrhal Fever (blue tongue). A fee to cover the cost of serum and virus will be charged.

2. The following charges shall be made and payable for services rendered by the Government Veterinary Surgeons in other cases, viz.:—

	£	s.	d.
(1) For every professional visit within three miles of his office or residence	0	5	0
(2) For every professional visit beyond such distance plus an additional charge of 2/6 per hour whilst engaged in such visits or £2 2s. a day of 24 hours;	0	10	6
(3) For advice given at the Veterinary Surgeon's office, for each animal, per visit	0	2	6
(4) The following to be charged in addition to visiting fees:—			
a. For every examination as to soundness, each	1	1	0
b. For castration, horses, each	1	1	0
c. For castration, bulls, each	0	5	0
d. For castration, donkeys, each	0	10	6
e. For parturition cases, mares, each	2	2	0
f. For parturition cases, cows, each	1	1	0
g. For other operations, according to nature, from 5s. to £2 2s.			

3. Double the above fees will be payable for services rendered on Sundays, public holidays, and between the hours of 7 p.m. and 7 a.m.

4. Applicants for the services of Government Veterinary Surgeons must at their own cost provide the necessary transport for the conveyance of these officers from, and back to, their residence or nearest railway station.

5. Farmers and owners of stock throughout the country frequently telegraph for a Government Veterinary Surgeon to be sent to attend an animal which has been taken seriously ill. It is rarely possible to comply with these requests at once, as the Veterinary Surgeon may be engaged on duty which he cannot leave, or is at such a distance from where his services are required that he can hardly be expected to arrive in time to be of any service in an urgent case. Hence much valuable time is wasted, the owner of the animal is dissatisfied, and the veterinary staff discredited. To obviate this, in all cases where veterinary advice and assistance are required, the owner should telegraph to "Veteran," Salisbury, with prepaid reply, the nature of the complaint that the animal is suffering from, giving as full and accurate a description of the symptoms as possible. This will enable the Chief Veterinary Surgeon to telegraph advice at once and state whether he is able to arrange for veterinary attendance on the case or not, and save valuable time, which is always of importance in acute cases.

6. The services of Government Veterinary Surgeons will only be available for private work with the consent of such officers, and when such work does not interfere with their official duties, or when the services of a private practitioner are not available.

7. As the arrangement of allowing Government Veterinary Surgeons to attend to private cases is intended purely for the benefit of farmers and stock owners who may wish to obtain professional advice, no responsibility whatever will be accepted for any loss of stock, etc., which may result from the negligent treatment or advice, or wilful default, of any Government Veterinary Surgeon.

8. All fees to be payable direct to the Government Veterinary Surgeon concerned.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 61. Requirements in sending Botanical Specimens to the Department for Identification.
No. 62. Services of Agricultural Engineer.
No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 90. Reports on Experiments—Experimental Station, Salisbury, 1910-1911, by J. H. Hampton.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.
No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultural Engineer.
No. 177. Notes on the Raising of Seedling Trees, by F. B. Willoughby.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 203. Ensilage, by J. A. T. Walters, B.A., and The Feeding of Ensilage to Dairy Cattle in Winter, by R. C. Simmons.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W. M. Watt.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 222. Costs of Farm Operations, Gwebi.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 126. Turkish Tobacco.
No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 138. Tobacco Culture (Virginia)—Harvesting and Curing.

No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 175. Notes on Lucerne, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch-Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 43. Citrus Psylla.
No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 140. Insect Pests of Tobacco in Southern Rhodesia, by R. W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 151. Potato Spraying Experiments for the Control of Early Blight, by Rupert W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 53. Animals Diseases Consolidation Ordinance, 1904.
No. 65. Common Ailments of the Horse, by D. R. Chatterley, M.R.C.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.
No. 180. Note on the Treatment of Biliary Fever of the Horse with Trypan Blue, by Ll. E. W. Bevan, M.R.C.V.S.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

LIVE STOCK.

No. 145. Prospects for Importation of Cattle from Australia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.
No. 242. Construction of Dipping Tanks (Revised).
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 134. Plans and Specifications for Flue Curing Tobacco Barns.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 157. Hints on Brickmaking, by G. T. Dyke.
No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 205. Home Butter Making, by R. C. Simmons.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 226. Classification of Clouds.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 237. The Analysis of Agricultural Products, Soils, Water, etc.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 260. Rhodesian Farm Orchard, by A. G. Turner.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 266. Directory of Farmers. (Price 1s.)
No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 275. War Settlement in Southern Rhodesia.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Malaria: its History, Prevention and Cure, by A. M. Fleming, C.M.G., M.B., F.R.C.S. (Ed.), D.P.H. (Camb.), Medical Director.
Game Law: Summary of.
Terms for Analysis by the Department of Agriculture, of Produce, Soils, Water, etc

HANDBOOK OF TOBACCO CULTURE for Planters in Southern Rhodesia. Sold by the Department of Agriculture. 2/6.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

M. and A.—Contractors, with 50 boys, prepared to do well sinking or other work on farms.

P. J. R.—As manager or assistant manager; Rhodesian farm experience, including tobacco. References to well-known farmers.

X. Y. Z.—As manager on estate or farm; experienced with pedigree and grade stock, agriculture and dairying. Excellent testimonials.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 473 of 1917.] [14th December, 1917.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following areas of infection and guard area :—

(a) *Areas of Infection.*

Farms Beza and Arawe, in the native district of Victoria.

(b) *Guard Area.*

An area in the native district of Ndanga bounded by a line drawn from the junction of the Mushavukwe and Mtilikwe Rivers in a northerly direction along the western boundary of the Ndanga district to the Mungesi River; thence down that river to the Nandari River and up the Nandari and Mutungururu Rivers to the headwaters of the latter; thence to the nearest point on the Rozwa River, down that river to the Turgwi River and down the latter to the eastern Nyamawongu River, up that river to its headwaters; thence direct to the headwaters of the western Nyamawongu River and down the latter to the Murerezi River, down this river to the Cheredzi River and up the latter to the eastern Rupiri River, up that river to its headwaters; thence direct to the headwaters of the western Rupiri River and down this to the Mushavukwe River and down the latter to the first-named point.

No. 482 of 1917.] [21st December, 1917.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 244 of 1917, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following area of infection and guard area in lieu thereof :—

Gwelo Native District.

(a) *Area of Infection.*

The farms Riverbend, Sunbury, Cross Roads and Wegdraai.

(b) *Guard Area.*

An area bounded by a line drawn from the south-western beacon of the farm Adair, along the western boundaries of that farm, Barkley, Turffontein, Cross Roads and Wegdraai, the western and northern boundaries of Krom Rivier, the northern and eastern boundaries of Doon, the south-eastern boundaries of Erin and Igogo to the Bembezaan River; thence up this river to the farm Nyamawera; thence along the western and southern boundaries of this farm, the western and southern boundaries of Ashdale to the most easterly beacon of the Que Que Reserve; thence following the south-eastern and western boundaries of this reserve to the south-eastern beacon of the farm Wodehouse; thence along the southern boundaries of this farm and Adair to the first-named point.

No. 28 of 1918.] [25th January, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 404 of 1917, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard areas in lieu thereof :—

1. Melsetter Native District.

(a) *Areas of Infection.*

The farms Moosgwe, Kronstad, Weltevreden, Rookwood, Cecilton, Wolverhampton, Helvetia and Woodstock.

(b) *Guard Areas.*

(1) The farms The Flats, Freshfields, Oxenholme, Curzon, Shinja, Westend and The Ranche.

(2) The farms Johannesrust, Lombard's Rust, Pietershoek, Camperdown, Riverange, Welgegund, Jameson, Constantia, Hendriksdal and Steynsbank.

(3) The farms Gwendingwe, Zebra, Brackenbury, Highlands, Joppa, Merrywaters, Heathfield, Kingsley, Lemonkop and Fairview.

(4) The farms Wolfscrag, Enhoek, Canterbury, Lansdowne, Heilrand, Dinglydell, Woodbine, Roslyn, Ratelshoek, Southdown, Bayswater, Goodhope, Eastleigh and Ravenswood.

2. Umtali Native District.

(a) *Area of Infection.*

The farm Engwa.

(b) *Guard Area.*

An area bounded by the southern boundaries of the farms Reserve, Minyinga South, Madagascar, Cronley and Inyaruparu to the Wengesi River, down this river to the Odzi River; thence northward excluding a two-mile strip along the east of the Odzi River until the northern boundary of Gilmerton is reached; thence along the north and north-eastern boundaries of Gilmerton, the north-western boundary of Clydesdale, the northern boundary of Mazonwe, the northern boundary of Brown Hill to its north-east beacon on the Portuguese boundary; thence southward along this boundary to the south-east beacon of Reserve.

No. 480 of 1917.] [21st December, 1917.

COMPULSORY DIPPING OF CATTLE: CHILIMANZI AREA.

IN accordance with the provisions of section 2 of the "Compulsory Dipping Ordinance, 1914," notice is hereby given that the owners resident in the area described below have, by a majority of votes, requested His Honour the Administrator to bring compulsory dipping of cattle into operation in the said area.

Any person desiring to lodge an objection to the bringing into operation of compulsory dipping as aforesaid shall do so on or before the 22nd February, 1918.

Description of Area.

The Chilimanzi cattle transport area as described by Schedule "A" to Government Notice No. 387 of 1914.

No. 489 of 1917.] [28th December, 1917.

COMPULSORY DIPPING.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Compulsory Dipping Ordinance, 1914," to cancel Government Notices Nos. 381 of 1914, 200 and 266 of 1916, and in terms of section 7 of the said Ordinance to declare that the provisions of the Ordinance shall

be applied in respect of cattle within the following areas from date of issue of this Notice, dipping to take place at weekly intervals except where the Chief Inspector considers it necessary to suspend or extend this period :—

The areas under the control of the Municipalities of Salisbury, Bulawayo, Gwelo, Umtali and Gatooma, the Sanitary Board at Victoria and the Village Management Boards at Que Que, Melsetter, Penhalonga, Marandellas, Hartley, Enkeldoorn, Avondale, Umvuma, Selukwe, Gwanda, Plumtree, Rusape and Blinkwater.

Further, His Honour the Administrator has been pleased to approve of a charge of one penny per head in respect of all cattle dipped at Government dipping tanks, except unweaned calves, for which no charge will be made; and one penny in respect of all horses, mules and donkeys, and one halfpenny in respect of all sheep and goats.

No. 491 of 1917.] [28th December, 1917.

APPLICATIONS FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
Cox Brothers ...	Chiswana	Marandellas	Farm Chiswana
P. Slement ...	Umfuli	Hartley	,, Edendale
B.S.A. Co. ...	Mazoe	Mazoe	,, Bloomfield
T. Huxham ...	,,	,,	,, Spitzkop
H. K. Kimpton ...	Umtali	Umtali	,, Ferndale
W. Woods ...	Unnamed	Melsetter	,, The Nest

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications, together with a full statement of the grounds for such objections.

No. 6 of 1918.] [4th January, 1918.

ESTABLISHMENT OF A POUND ON FARM HAIG, VICTORIA DISTRICT.

HIS Honour the Administrator has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Victoria, to declare and make known that a pound has been established on farm Haig (Fairburn), near Felixburg, in the magisterial district of Victoria, and that the said pound shall be available for the public from date hereof.

No. 20 of 1918.] [18th January, 1918.

POUND AT FORT RIXON.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Bulawayo, to declare and make known that the pound on the farm Liscard, near Shangani, established by Government Notice No. 216 of 1914, is hereby abolished; that a pound

has been established on the farm Hlolo, Fort Rixon, in the magisterial district of Bulawayo, and that the said pound shall be available for the public from date hereof.

No. 21 of 1918.] [18th January, 1918.

HIS Honour the Administrator in Council has been pleased, under and by virtue of the powers conferred upon him by His Excellency the High Commissioner's Proclamation No. 42 of 1917, to declare that, until further notice, the export of bones, crude potash in any form, guanos, or any preparation of such bones, potash or guanos capable of being used in the manufacture of fertilisers, is prohibited except with the permission of the Director of Agriculture.

STRENGTH OF CATTLE DIPS.

WITH reference to Government Notice No. 178 of 1917, wherein is laid down the percentage solution of arsenious oxide required in cattle dips in areas in which dipping is compulsory under the "Animals Diseases Consolidation Ordinance, 1904," and the "Compulsory Dipping Ordinance, 1914," it is hereby notified for public information that the following dilutions of the dips now commonly used are required to conform to the standard solutions referred to :—

1. Natal Laboratory Dip.

For three-day dipping—
4 lbs. arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

For seven-day dipping—
8 lbs. of arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

For fourteen-day dipping—
12 lbs. arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

2. Cooper's Improved Cattle Dip.

For three-day dipping—
1 gallon of dip to every 312 gallons of water.

For seven-day dipping—
1 gallon of dip to every 156 gallons of water.

For fourteen-day dipping—
1 gallon of dip to every 104 gallons of water.

3. Arsenoda Dip.

For three-day dipping—
1 gallon of dip to every 700 gallons of water.

For seven-day dipping—
1 gallon of dip to every 350 gallons of water.

For fourteen-day dipping—
1 gallon of dip to every 233⅓ gallons of water.

4. St. O'Gorman Cattle Dip.

For three-day dipping—
1 gallon of dip to every 400 gallons of water.

For seven-day dipping—
1 gallon of dip to every 200 gallons of water.

For fourteen-day dipping—
1 gallon of dip to every 133⅓ gallons of water.

J. M. Sinclair,
Chief Veterinary Surgeon.

Veterinary Department,
Salisbury, November, 1917.

Homestead of Mr. G. A. Dobbin, Omeath Farm, Umvukwe Hills.

THE RHODESIA

Agricultural Journal.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

BULAWAYO SHOW.—The eleventh annual show held by the Bulawayo Agricultural Society will take place on 28th and 29th of May. It should be noted that this year the May show will be one consisting almost entirely of live stock, as it has been decided to hold a fat stock and maize show later in the season, when all kinds of farm produce will be exhibited. This seems to be a sensible innovation, and it should be possible, in August or September, to secure a far larger and more representative series of entries for general produce than would be possible in May or June. The distinguishing feature of the Bulawayo May show is, as usual, the very fine list of championship prizes in the cattle classes, headed by the Thousand Guinea Gold Trophy for the

champion bull of Rhodesia open to bulls of any breed and any age. There is a very keen competition for honour of this award, which has previously been won by Mr. C. S. Jobling in 1914, and since then three times consecutively by Mr. C. Drummond Forbes. There are six other championship prizes presented by various supporters of the society, besides all the usual prizes in the different classes for cattle, sheep, goats, pigs, horses, mules, donkeys, dogs and poultry.

The only produce sections in May will be for butter, cheese, bacon, hams, vegetables, fruit and flowers; besides which there will be a section for household requirements, such as jams, preserves, bread, pastry, etc. The implement section will cover dairy appliances, vehicles and harness, and there will be a section for woodwork specially intended to encourage boys to take up this useful adjunct to farm work. The prize list includes the usual attractive riding, driving and jumping competitions. We wish the Bulawayo Agricultural Society all the success they deserve.

The Rhodes Matopo and Inyanga Estates.—In 1917 arrangements were completed for the transfer from the Rhodes Trustees to the Administration of the control and management of the Rhodes Matopo and Inyanga Estates. At the next meeting of the Legislative Council legislation confirming this transfer will be proposed.

The Matopo Estate is a block of land, near Bulawayo, 45,326 morgen in extent. Hitherto part of it has been administered by the Trustees direct and part leased to a number of tenants. A large proportion of the property is on schist formation and other portions on granite, the latter including the "World's View," the Grave, the Park and the Arboretum.

The Inyanga Estate consists of 46,748 morgen of land situated in the most mountainous part of Inyanga, ranging from 6,000 to 8,000 feet above sea level, parts rugged but mostly steep, smooth mountains covered with short, thick grass and well watered. The climate is cool, with cold winds and prolonged soaking mists.

Under the will, Mr. Rhodes directed primarily that the estates were to be cultivated "for the instruction of the people of Rhodesia," but also included "preserving, protecting, maintaining, adorning and beautifying the said burial place and hill and their surroundings," and further desired that a portion of the property be maintained as a park and planted with every possible tree. By the term "cultivation" Mr. Rhodes particularly included "experimental farming, forestry, market and other gardening and fruit farming, irrigation and the teaching of any of those things, and establishing and maintaining an agricultural college." It is fitting that this great heritage of the people of Rhodesia should be administered by the Government, and the Department of Agriculture, with its staff of experts already working on those special subjects, is now charged with the duty of carrying into effect Mr. Rhodes's wishes in these respects.

Efforts will be made to fulfil his instructions in spirit and letter

so far as possible, but the development of Mr. Rhodes's ideals must be a matter of time, and in some directions will not be easily attained, owing to limitations beyond control, such as the nature of the soils on both estates, the remote situation of the Inyanga Estate, and the question of finance.

It is intended to continue and further develop the good work already done on the two estates, and to enlarge its scope in the direction indicated by the will, as soon and as far as circumstances permit.

Advice to Settlers.—We hope to publish during the next few issues a series of articles by Mr. R. C. Simmons, Controller of War Settlement, written primarily for the instruction of new chums taking up farming in Rhodesia, especially men who have been on active service and who may not necessarily have been farmers before the war, and who therefore have much to learn. It is the local application of farming knowledge which the stranger finds it so difficult to obtain, and often only gains in the costly and slow school of experience. These practical hints will, we feel sure, be read with interest not only by the new settler but also by the established farmer.

"Sand Pumps."—Many of our rivers, especially in Matabeleland, have sandy beds, and, in the dry season, may shew little or no surface moisture, while quite an appreciable quantity of water may be flowing in the interstices of the sand below at comparatively shallow depths. The native fashion of obtaining this water is the primitive one of scooping out the sand until the water is reached. These pits, owing to their unscientific construction, keep falling in, and in floods are completely filled up. An alternative method of tapping the underground water has been tried with success. The apparatus used is generally called a "drive point" or "sand pump." The principle is simplicity itself. A tube of steel or iron, with a pointed end attachment, and with perforations in the tube extending to about four feet from the point, the perforated area being covered over with fine wire gauze, is driven into the sandy bed of the stream, and, after the water has been tapped at a depth of three or four feet over the gauze, an ordinary reciprocating type of pump is inserted in the tube. The water entering the tube through the perforations reaches the pump free of sand, owing to the filtering action of the wire gauze. These pumps are found to last quite a long time, and to suffer but little from being buried during floods.

Forestry in the Matopos.—This month we publish a report by Mr. W. E. Dowsett, F.R.H.S., Curator of the Matopo Park, in which he gives an account of the results of experimental forestry which has been carried on there during the last 14 years. Careful records have been kept of temperatures and rainfall at this station for the same

period, and they clearly shew that the conditions under which young trees have to be raised in the Matopos are peculiarly trying, owing to the extremes of heat and cold and the great variability of the rainfall. The report is to be regarded as a concise statement of past work, the results of which will be a guide for future operations. The very long list of exotic and other trees given by Mr. Dowsett shews how consistently he has striven to carry out Mr. Rhodes's wish that "every kind of tree" should be tried. His careful notes on the behaviour of each species tested indicate that a high proportion of the introduced trees will not succeed in the Matopos; and this negative result is of value, in that it will save others from carrying out costly experiments, and he does not neglect to point out that the failure of a tree in the Matopos does not necessarily mean that it would not do well in other parts of Rhodesia where conditions might be more congenial. The results, however, are not all negative, for a perusal of the report proves that a fair number of useful and valuable trees have been found capable of thriving under the unfavourable conditions of the Matopos, and may, generally speaking, be expected to do even better in other parts of the country. We feel sure that the report will serve a useful purpose. It will shew that, whereas Mr. Rhodes wished "all possible trees" to be grown, it has now been proved that many are impossible, and in future energies can be devoted to planting those that have stood the trial and are, therefore, possible.

Marandellas Creamery.—We are pleased to note that the Marandellas Creamery and Bacon Factory has begun active operations. Its products, already on the market, are cheese, butter, bacon and hams. We understand about 300 pigs are being killed and 3,000 pounds of cheese made each month. There should be no difficulty in finding profitable markets for all the factory can turn out, provided a high standard of quality is maintained. Local enterprises of this kind are extremely valuable to farmers in the district, and, by providing ready cash at short intervals, are a great help to struggling settlers, who might otherwise have difficulty in meeting current expenses. They are also to be welcomed as encouraging the maintenance of dairy herds and stimulating an interest in the careful management of live stock of all kinds.

The Red, White and Roan.—We have just received a copy of the Annual issued by the Shorthorn Society of South Africa. The first object of the society is "to further the interests of the cattle breeding industry in South Africa; and more particularly to encourage the breeding of Shorthorn and Lincoln-Red Shorthorn cattle, and to promote impartially all the various types and strains of such cattle." The present position of the Shorthorn breed in South Africa and its steady advance in numbers and quality are both a justification for the existence of the society and a proof of its usefulness. The Annual makes interesting reading for anyone in the cattle breeding business.

and we recommend to them its perusal. From it we glean that, although the Shorthorn came relatively late to South Africa, he is more than holding his own with other breeds. In Southern Rhodesia he easily heads the list of all imported breeds, while what he is doing at the shows throughout South Africa may be illustrated by the following extract from the Annual:—

"At the Mooi River Fat Stock Sales in August, 1916, out of 48 cattle entered, 27 were grade Shorthorns, and all but one of the first prizes were won by the grade Shorthorns. In the under four years old class the Shorthorn first and second prize oxen weighed 1,800 and 1,799 pounds. In the any breed, any age class, the Shorthorn prize-winner weighed 2,322 pounds.

"The two fat Shorthorn grade oxen exhibited by Messrs. Abbott Bros. for the War Fund weighed 2,545 and 2,462 pounds, and were sold for 54½ and 50 guineas respectively.

"At a Christmas stock fair in Kingwilliamstown district, the champion ox realised £43, and the best four oxen £34 each, the five oxen averaging £35 16s. These cattle were of the Shorthorn breed.

"At the Bulawayo and Salisbury Fat Stock Sales, Mr. Hull's Lincoln-Red Shorthorn oxen won many prizes in competition with all breeds. A three-year-old steer at Salisbury weighed 1,014 pounds dead weight, whilst twelve steers three to four years old, sent to Johannesburg, averaged 1,000 pounds dead, one three-year-old weighing 1,120 pounds dead. These steers were raised on cows milked once a day.

"In the block tests held in connection with the Witwatersrand Fat Stock Sales, September, 1917, Messrs. Thomson & Arnott won with their Shorthorn oxen, competing with Angus, South Devons and Herefords, the championship for group of five oxen, and reserve championship for single ox. It is noteworthy that in these tests these Shorthorns were very little short of the Angus in percentage of carcase to live weight and scored heavily over all breeds as regards weight for age."

In the list of members of the Shorthorn Society of South Africa there appear the names of 45 Rhodesians, or 20 per cent. of the total membership, which seems a very high proportion when regard is had to the relatively small population and short period of occupation of this country compared with the Union, and shews how strong a position the Shorthorn breed has secured here. Messrs. E. A. Hull and F. J. Newton represent Rhodesia on the council of the society.

Shortage of Dip.—Farmers are everywhere experiencing difficulty in obtaining supplies of the recognised proprietary dips, and the prospects for the immediate future in this respect are none too good. The reasons for this lie first in the restricted shipping available owing to the war, and the fact that the materials from which the drums are made are urgently required for war purposes, and the supply to dip manufacturers is accordingly very restricted. Added to this, railway difficulties, owing to the floods, have delayed the delivery of such small

supplies as have lately been landed at Beira, although this last feature is comparatively a minor and transitory trouble.

Although difficulty in obtaining proprietary dips is foreseen, there is fortunately no occasion to relinquish or even slacken the practice of cattle dipping, as fortunately there are good stocks of arsenite of soda available in the country at present, and every prospect of obtaining more as required. In this connection the following extract from a report of a recent meeting at Bulawayo of that most useful and practical body, the Rhodesia Munitions and Resources Committee, will be read with interest:—

"The Chairman reported that the syndicate which was undertaking the manufacture of arsenic in the Umtali district hoped to turn out five tons of the powder this month of 98-99 per cent. grade, and ten tons monthly thereafter with the present unit of plant. The arsenic was being sent to the Union at present to be made into arsenite of soda, and he understood that at least one-third would be sent back to this country in that form. The firm making the arsenite of soda, Mr. Cunningham informed the meeting, was prepared to sell at a comparatively small profit on the manufactured cost, and was now endeavouring to ascertain the best and cheapest method of distribution to the farmers, in order that the latter body might reap the advantage of a local product."

Farmers would be well advised to acquaint themselves with the mode of preparation of dipping fluid using arsenite of soda, and for their guidance we print instructions on another page.

New Kinds of Bread.—In this issue we conclude the series of recipes for various methods of utilising the grain and meal of maize for home cooking. We commend them to our readers for trial, and we can say from personal experience that some of these recipes are excellent. At present we cannot locally produce all the wheat required to supply the usual requirements of the country, and there are difficulties about the importation of flour. Therefore, it behoves us to spare no effort and to use all our ingenuity in attempting to find good substitutes for wheaten flour. In this connection we call attention to an article on the food value of ground-nuts appearing in this issue, from which it will be seen that a technically "perfect" food can be made by mixing ground-nut-cake-flour, and certain other cheap ingredients, with wheat flour for bread making. Those farmers who grow rye may find the following hint from the past of interest. The famous American writer, Thoreau, who, it will be remembered, lived alone in the woods and catered for himself, says:—"Bread I at first made of pure Indian (maize) meal and salt, genuine hoe-cakes, which I baked before my fire out of doors on a shingle or the end of a stick of timber, but it was wont to get smoked and to have a piny flavour. I tried flour also; but have at last found a mixture of rye and Indian (maize) meal most convenient and agreeable." He does not give the proportions of his mixture. Perhaps some of our readers would experiment with mealie meal and rye flour and let us know the results.

Establishment of a Dairy Herd on Granite Veld Farm by a New Settler.

By R. C. Simmons, Controller of War Settlement.

The average new settler on a mixed farm will be practically obliged to take up dairying amongst other branches of agriculture, in order to utilise his crops to advantage and to realise the necessary cash to meet his monthly expenditure. The question as to whether or not he may eventually give up dairying and devote all his energies to breeding for stud or beef purposes is one which he may well leave for consideration until after he has had time to develop his farm somewhat. His wisest course at the commencement will be to purchase a number of cows and heifers of fairly good dairy type, and, in addition (provided his funds will allow), a number of cheaper and hardier animals, to be graded up with the same bull as the dairy cows, or at least with a bull of the same breed. The reasons for using the same bull on the cheaper cows are, first of all, the expense of purchasing two good bulls which any other course would entail; secondly, the impracticability of successfully running two breeds or types on an unfenced and unimproved farm; and, thirdly, because he will not usually be able to purchase a sufficient number of better class dairy cows to enable him to realise the full use of his bull, especially if it be a good one and expensive.

The Purchase of Dairy Cows and Heifers.—It is assumed that the settler will enter on to his farm in the autumn or winter, and that he will require some milk for himself and household at once, but that he will not attempt to commence commercial dairying until the following spring, that is, until there is sufficient grass to maintain cows in milk and their calves. For the purpose of supplying his own immediate needs, he should purchase two or three hardy, better class native cows or slightly graded cows, which he will probably be able to obtain near at hand from one of his neighbours, and which will be able to forage for themselves through the winter or will require the minimum of attention and extra feeding. He should then look round for, say, 20 graded heifers, first or second cross from native cows, in calf to a bull of dairy type and due to calve down in October, November or March. In addition to these, he should acquire, say, 10 cows with the second or third calf of the same type as the heifers or possibly a little better, due to calve in October and November or March and April.

What is known as a grade dairy cow cannot be expected to possess the outward characteristics of her kind in such a marked degree as a pure-bred dairy animal, and one cannot rely quite so much on outward signs as in pure-bred animals. Nevertheless, the purchaser should keep in his mind's eye the model of a pure-bred dairy cow, and should endeavour to purchase from herds in which he knows that bulls of dairy breeds and not beef breeds have been principally used. A photograph of a really good Jersey cow would be a good thing to study in conjunction with a photo of a pure-bred Aberdeen Angus cow. Very few grade cows in this country will closely resemble either, but those more nearly resembling the Jersey will usually be the most suitable, and those tending towards Aberdeen Angus characteristics should usually be avoided, unless evidence that they are good milkers is forthcoming.

The following table gives a few of the more outstanding points to be sought or avoided when purchasing grade dairy cows or heifers:—

Desirable qualities.	Qualities to be avoided.
General.—An appearance of health and strong constitution.	Weakly, narrow-chested and unthrifty animals.
Head.—Medium in size, refined but strong muzzle, face lean and long and slightly dished, ears thin and active and yellow-skinned, horns medium and fine.	Short, very broad straight face with approximately horizontal line from chin to throat, broad thick ears, heavy coarse horns, wild disposition.
Neck.—Long and light, oval and flat on the side, fine at the junction of the head, and making an abrupt junction with the shoulder.	Medium to short, uniting smoothly with the head and widening gradually into the shoulder.
Shoulders.—Light and spare and fairly oblique.	Straight, coarse shoulders well covered with flesh and wide over the withers.
Back.—Narrow and fine at withers and broad at loin, well-defined spinal column, tending to arch over the pelvic region.	Broad, level and heavily-fleshed from poll to tail.
Hindquarters.—Long, wide, deep, devoid of surplus flesh, thigh slightly incurving or flat from all points of view.	Heavily-fleshed down to the hock, with thick, well-filled thighs.
Ribs.—Well sprung, strong and deep, with a tendency to slope obliquely backwards rather than to hang very perpendicularly.	Flat, short ribs.
Girth.—At heart good, larger at flank, with a good roomy abdomen.	Practically equal at heart and flank, with a very level underline.
Udder.—Long, broad, extending well forward and well up behind, teats evenly placed and medium in size, fine soft skin and hair.	Very small or ungainly and ill-shaped udders.
Milk Vein.—Large, tortuous and much branched, entering the abdominal wall well forward.	
Skin.—Fairly thin, elastic and soft to handle, covered with fine hair.	Harsh, thick and tight hide and short coarse hair.

Note.—Thinness arising from malnutrition or want of constitution must not be taken for fineness of build. The expression "fineness" or "coarseness" denotes rather the difference which one recognises between a thorough-bred horse and one of thick cobby weight-carrying type. In older grade cows of the type under discussion many good milkers have udders which scarcely conform to the standard given, and one must not attach too much weight to this point without making enquiries. In heifers, before they have calved, the shape and quality of the udder should be closely examined.

The Purchase of the Bull.—The bull selected to head this herd should possess as nearly as possible the following attributes:—He should be of a breed known to be good milk producers; a bull, for instance, of the milk-strain Shorthorn, Red Lincoln, South Devon, milk-strain North Devon, Friesland, Ayrshire, Red Poll or Jersey breeds would be suitable. The beef-strain Shorthorn, North Devon, Aberdeen Angus, Hereford, Sussex and Africanders should be avoided. In stipulating that the bull should be one of certain breeds, it is recognised that the settler may not be able to purchase a pure-bred bull. Should this be the case, he should endeavour to get a high-grade bull, one having, say, three crosses of the blood of one of the breeds recommended, and whose original dam may have been native or Africander, or possibly of mixed colonial breeding. The influence of the sire on breeding milch cows is of the highest importance, and he should be from a known good milking herd out of a good yielding and prolific cow. Dairy bulls are, as a rule, longer in the body and lighter in the flank than beef bulls, and they do not for this reason appeal to the eye of the general public as much as beef bulls. This lightness, however, may be disregarded, since the settler desires milk, not beef, although of course he will be pleased if his steers have reasonable carcases.

Although lightness (not weakness) of the hindquarters may be overlooked, narrowness of the chest or girth, weakness of the spine or any sign of femininity or want of masculine vigour must on no account be permitted. No bull is good for any purpose that is lacking in vigour and strength of constitution. The most feminine females (which are what the dairyman wants to produce) are likely to be sired by the most masculine males. Masculinity in the bull is not necessarily coarseness of bone or horn, but is denoted rather by a strong, active carriage, mild but strong eye, and a general look of thrift and ability to take care of himself.

The reproductive organs of the bull should be large and well formed; the rudimentary teats should be evenly placed. He should have the characteristic markings and shape of his breed, and should not be less than two years old at the time he is required for service. The actual breed or grade to be chosen is a question which can only be discussed when the settler has decided where he will commence farming, but as a rule the lighter, more compact breeds will suit granite veld farms better than the larger breeds.

The settler will hear many opinions expressed in favour of what are known as dual-purpose breeds. While breeds are to be found which will give a good beef carcase and at the same time will milk well, it

must always be remembered that the more dairy-bred an animal is the less able will it be to withstand ordinary veld conditions. Therefore it cannot be expected that a steer bred from a cow of pronounced milking qualities will graze and thrive and grow on the veld as well as one from a herd less developed as regards milk. On rich well-developed farms the steers from dual-purpose cows are no doubt extremely profitable, since on such farms they may always be provided with the necessary supplementary feed and attention. We are, however, considering the case of a new settler on an undeveloped granite veld farm, who, if he goes for beef at all, wants a hardy animal that will graze and thrive on the veld with comparatively little attention till it is about two-and-a-half or three years old. He will wish to sell such a beast straight off the veld, or to fatten it, say, for three months, and then sell it. In so far as his dairy business is concerned, he wants a cow that will give the greatest profit for the greatest amount of feed consumed, or, in other words, which will turn the greatest amount of food into milk. It is the firm opinion of the writer that he will be wise to run his dairy and beef herd as two distinct sections, and to take up beef production as a separate business after his dairy herd is organised. It is far easier for the amateur breeder to breed for one definite object in one animal than to try and combine the two; only the most experienced may be expected to breed dual-purpose animals successfully. The question of the sale of cows for beef after they have milked a few seasons, as is the custom sometimes in England, does not come within the contemplation of the Rhodesian farmer, who cannot afford to kill any female beast that will breed a strong calf. The whole advantage of dual-purpose animals to the farmer we are considering lies in the sale of a few steers and a pound or two a head on his old worn-out cows at a canning factory, for which he probably sacrifices many pounds' worth of milk which he might have obtained had he not tried to get both beef and milk from the same animal. Now, whilst holding this view, the writer would warn the breeder of dairy cattle against the folly of breeding from animals descended from heavy milkers without due regard to constitution. It is this mistake which in some instances has rendered the steers from dairy stock so useless. Almost any breed of cattle possessing constitution and strong frames will produce saleable steers, and if the settler cuts out consideration of beef qualities and keeps milk and constitution only in view when choosing either his dairy bull or dairy heifers, he will not go very far wrong, and he will not lose money on steers from the dairy herd.

The Necessity for Constant Supervision and Care.—Dairying is a type of farming which should be undertaken seriously and thoroughly, or not at all. Ample proof exists to shew that when the dairy herd is tended with care, and proper provision is made for the winter feeding of the cows and young stock, a reasonable return at least and often a very good return may be expected. Unfortunately, equal proof exists to shew that when dairying is entered into half-heartedly, or the procedure recommended not only by our own Agricultural Department but by every competent authority in the world is seriously departed from, ultimate loss and disappointment are sure to follow. The intelligent management of a dairy herd does not in Southern Rhodesia

necessarily entail hard, strenuous work, but probably no branch of agriculture calls for such constant daily thought and supervision throughout the year. This statement need in no wise alarm the new settler; it is made merely to emphasise the fact that slackness spells loss. If the work is organised properly and conducted systematically, there is no reason why it may not be successfully undertaken even single-handed, in spite of the undoubted drawbacks attaching to native labour. In this connection it may be mentioned that Bureau boys are more satisfactory than native local labour for herding and milking, on account of the fact that one is certain of their services for at least twelve months at a time.

The type of animal recommended to the settler is quite good enough (especially from the point of view of the production of butter fat and cheese) to be considered a dairy cow. The functions of all dairy cows depend in a large degree on the proper working of a highly-organised nervous system, in contra-distinction to the functions of the beef animal, which calls for no special nervous effort. The dairy animal from birth onwards should never be beefy, but she should be in a good, strong, thrifty condition, and she should never be worried. In order to ensure this, she should be shielded throughout her life from any form of discomfort, whether it be in connection with food, climate or manual treatment. The better the cow, the more delicately organised she is, and the quicker she will respond to the conditions of her environment. The kind of cow that will give a yield of milk far in excess of the requirements of her calf is a product of selection and special treatment by man. She is not a natural product, therefore she cannot continue her functions under purely natural conditions, but must have that attention and care which has been the cause of her abnormal powers. Without such care, she and her progeny will tend to revert to a state of nature in which they will give enough for the maintenance of their calves only, and will use all food and energy over and above what is required for that purpose in the formation of flesh and the building up of their own bodies; in other words, they will revert to beef animals.

Next, then, in importance to the selection of the herd comes its feeding. The settler will have to depend more or less on the veld for the maintenance of his new herd during the first winter and summer, but we have seen that until the grass arrives they will be dry, so no great trouble need be anticipated. From the commencement of the first autumn onwards it should be his object to provide such a supply of food that neither the bull nor the cows nor the young stock shall suffer from want of feed at any time of their lives. If the bull or the cows are poor at the time of mating, it is not reasonable to expect that they will beget as strong a calf as if they were fit. The cow cannot develop the calf she is carrying to its full extent unless she has sufficient food to maintain her own body and that of the unborn calf in full health. The calf cannot grow from calfhood to the full perfection of its own mature kind if its mother is allowed to be short of food from which to make milk for it, or if it itself is suffering during any period of its growth from a shortage of food. There is no time, therefore, in the life of a dairy animal when an appreciable shortage of food or absence of careful treatment does not result in loss either of growth, constitution or milk

yield. Neglect of in-calf cows or young growing calves is especially serious, since it tends to cause weakness of constitution, which is in turn handed on by the individual calf to its progeny, and so becomes a cumulative evil. On the other hand, care and attention tend to build up constitution, growth, early maturity and milking qualities which are equally inherent and cumulative in effect and tend so to strengthen the herd that the amount of artificial food required for their maintenance is gradually, in the course of a generation or two, reduced to a minimum; possibly it would be more correct to say that the margin of productiveness of the herd over cost of upkeep is raised to the maximum.

Quantity and Varieties of Food Required.—The amount and kind of feed required by the type of cow under discussion varies considerably with the season of the year, that is to say, the amount and kind of food which the settler must provide artificially. In order to understand the matter properly, it must be approached from a more or less scientific standpoint; at the same time in this article any attempt at scientific exactitude will be avoided as being unnecessary, and likely to confuse rather than assist the new settler. It is assumed that the settler will have acquired some elementary knowledge of the principles of animal nutrition, either from Bulletin No. 190 of the Department of Agriculture or from one of the various standard works on this subject. Let us take as a basis from which to start the following ration for the average dairy cow:—

Total dry matter.	Digestible matter.				Nutritive ratio.
	Protein.	Carbo-hydrates.	Fat.	Total.	
24·31 lbs.	2·15 lbs.	13·27 lbs.	·74 lb.	16·16 lbs.	1 : 6·9

This ration, plus about 75 lbs. of water, represents the kind and quantity of daily food required by a cow in full milk. When grazing on good, sweet, mature pastures in a normal season she will pick up about 100 lbs. weight of grass for herself, which will contain all her requirements. There are only a few months in the year in Southern Rhodesia when it may be assumed that a cow, in the course of a day's feeding from the pasture alone, will obtain all the above requirements, and it is the business of the feeder of dairy stock to study the variations in the condition of the pasture, and to make good all that may be lacking in it. It will be more convenient to consider this subject month by month, beginning in the spring of the year, *i.e.*, December, when the first fair supply of green grass may be expected. From December to about the 15th February the grass in this country is usually green, rank and immature. It contains all the various kinds of food required, but, being very watery and washy, it will be difficult for the cow to hold sufficient weight of grass to obtain the requisite solid matter. It is a matter of common observation that during a time of excessive rainfall cattle often fall off somewhat in spite of plenty of grass, and science gives us the reason for it:—

	Dry matter.	Protein.	C.H.	Fat.
100 lbs. of green succulent grass contains approximately ...	20 lbs.	2.6 lbs.	10.6	.5
This falls short of the standard ration by	4 lbs.	0 lbs.	2.67	.24 lb.

which latter quantities should be made up by artificial food. About 4 lbs. of maize meal will supply this deficiency, and its addition to the ordinary veld feed during the spring and early summer months is advisable in the case of a heavily milking cow, and especially in wet weather. If maize is very expensive, and the cows not heavy milkers, 2 lbs. per diem may be profitable, or, in the case of maize being unobtainable or its price prohibitive, 5 lbs. of oat hay or teff hay or 6 or 7 lbs. of good veld hay would go far towards putting matters right. When feeding hay at this time of year, cows will often refuse to eat it when they come in at night, but if they are yarded or stabled they will eat it before morning, especially if it is damped with brine. In this connection, it may be pointed out that during these wet months dairy cows are better sheltered at night with a little fodder of some kind than exposed to the weather in the veld. Times do occur, however, for short periods in the wet season when midges and mosquitoes are so bad near the kraals and sheds that one is almost forced to allow the cattle to run at night.

From February to the end of April the grass in Southern Rhodesia is usually at its best. If the heavy rains have ceased and the weather be not too cold, the animals may be left out at night, when, provided the grazing be not too far from the milking sheds, they will get all their requirements from the veld. Should the veld get a little dry, a small ration of Napier fodder or sweet potato tops will be found advantageous. With the advent of May and possible frosts, one must be prepared to supply much heavier rations to the milch cows, and in many seasons these may have to be continued right on to the end of November. From June to October is probably the most trying time, and the rations given below apply more particularly to these months, but should be begun some time in May. With every care in the utilisation of winter grazing, it will be wise to reckon that the cows will not pick up more than half enough to last them 24 hours, and that that half will be either very dry or very green and immature. Should absolute drought occur, or, on the other hand, should the season be unusually mild, the farmer may easily adjust the feed accordingly, but he should provide artificially half the standard ration.

Either of the following daily rations will suffice for this, and will supply the necessary succulence:—

1. Maize 4 lbs., ground-nuts 2 lbs., majordas, pumpkins, Napier fodder or ensilage 30 lbs., good veld hay 5 lbs.
2. Sweet potatoes 15 to 20 lbs., ground-nuts 2 to 3 lbs., good veld hay 5 lbs.
3. Green forage (such as barley, rye or oats) 10 lbs., majordas 20 lbs., ground-nuts 2 lbs., veld hay 8 lbs.
4. Green forage 8 lbs., maize 2 lbs., ensilage 20 lbs., ground-nuts 2 lbs., veld hay 8 lbs.

In cold weather No. 4 ration, containing 2 lbs. of maize, will be rather better than No. 3 ration, which contains rather much succulence, or 1 lb. beans might be added to No. 2 ration. The foregoing cannot be regarded as recipes, but will give a fair indication of the kind and quantity of food required.

The intelligent farmer will begin at the commencement of his planting season to provide for his cows in the following winter. We have seen approximately the kind of foods required and the amount of the rations. We must now calculate how much land it will be necessary to cultivate in order to provide this food. We will reckon on making provision for 30 milch cows. It will be necessary, in order to be on the safe side, to grow the following:—

Crop.	Amount.	Acreage required.
Maize	200 bags	50
Ground-nuts	160 bags of 80 lbs.	30
Majordas	54 tons (4 months' supply)	5
Maize for ensilage	30 tons (2 months' supply)	5
Green forage, according to extent of suitable vlei; if no vlei suitable, sweet potatoes		10
Teff grass as additional provision		10
Beans as additional provision		5
Napier fodder		5
Total		120

Ten acres of the maize may be cut and stooked for stover, or should the crop look like being a failure for grain, more of it may be treated in this way, or it may be cut green and put into the ensilage pit. In addition to the above, the farmer needs to cut about 20 tons of good veld hay, which with, say, 10 tons of teff hay, 30 or 40 tons of stover, the vine from the monkey-nuts and so forth, should be ample for his cows and the usual young and dry stock belonging to such a herd. The sweet potato is a specially valuable crop, as it is easily grown on the sand veld. The tubers form an excellent feed for cattle in winter, and remain good in the ground until required for use, whilst the tops form a splendid green food in the earlier winter months. Mangels, dhal, sunflower and various other crops may also be grown, and would take the place respectively of some of the majordas or ensilage and ground-nuts. The crops dealt with in this article are, however, the safest for the new settler, who obviously cannot afford to take more risks than are necessary.

Cows to be Fed according to Yield.—The foregoing recommendations are based on the requirements of the average cow of the type under discussion. In considering them, the fact must not be lost sight of that the cow must pay in her progeny and milk products for the feed given her. However carefully the settler may purchase his herd, it is tolerably certain that some of his cows and heifers will be considerably better milk producers than others. At the commencement it will scarcely be practicable for him to make a very detailed division

of his cows according to production, but he may, and in fact he should, divide them into at least two lots, namely, those that are the best producers and those that are inferior, such as perhaps some of the cheaper cows purchased. He will then feed the two lots separately, according to results in production. As long as the animal remains in good, strong, healthy condition, it is not profitable to increase her feed, or to feed more expensive foods, unless evidence is forthcoming that by so doing the milk flow is increased or maintained.

A rough and ready way of ascertaining whether or not this is the case is to weigh the milk of each cow morning and evening at least once a week (or even daily if it can be conveniently managed), and to keep a careful record of these weighings, and a note of the approximate amount and kind of foods given, the condition of the veld, weather conditions and so forth. If butter or cheese production be the settler's object, it is not sufficient to know merely the actual bulk of milk produced, but the fat percentage of the milk as well, and steps should be taken, either by direct chemical test or by careful observation of the amount of butter and cheese produced, to ascertain this. The other contents of milk are, of course, of the highest importance, but if the new settler contents himself with ascertaining the fat percentage he will not go far wrong, and he will not be attempting anything too complicated for the limited accommodation and assistance available. Every cow has what may be described as the maximum capability in fat production which she can attain when in perfect health and under entirely suitable conditions of food and environment. Should she be having unsuitable food, or too little food, or should she be suffering from any kind of discomfort, she will give less than her maximum percentage of fat, although she may be giving quite a fair amount of milk. Should it be discovered that the milk is poor, then a change of feed or increase of feed may rectify the trouble, although perhaps the bulk of milk produced may not be changed. It is on the foregoing lines, namely, by the observation of the return of milk products in relation to feed, that the subsequent selection of the dairy herd will be made, and the unprofitable cows returned to the breeding herd or be disposed of.

Time of Year at which Cows should Calve.—It will depend very largely on circumstances whether it will pay the farmer best to let his cows calve in summer or in winter, but the new settler, dependent on mixed farming, and looking for the sale of his crops through his cows, will find it profitable to let a fair proportion of his cows calve in the autumn or winter, so that he can utilise his feeds at a time when the returns for milk and milk products may be expected to be at their highest. In order to earn the money for his monthly payments, he will naturally let some of his cows calve in summer. This is a matter which he must arrange by keeping some of his cows and heifers from the bull until such time as the exigencies of his business require that they should be mated. It is not always an easy matter in this country to get cows in calf just at the time of year one requires them. Some forethought and management are necessary, and it is an additional reason for always keeping the female stock in

good fettle. Cows and heifers are more likely to come into season regularly when they are in good condition than when they are poor. A supply of winter calvers can best be obtained by keeping back the young heifers from the bull until about June or July. At the commencement it has been pointed out that the settler will be wise to purchase a few of his cows and heifers due to calve in winter. Experience varies in different parts of the country as to the best time of year (from the point of view of the health of the calf) to allow calves to be dropped. The dairyman must be guided, however, by the question of the sale of milk products. As a rule one tries to avoid the advent of calves in December, January and February, which are usually our wettest months, or in August or September, which are often very trying months as regards grazing and climatic conditions. No hard and fast rule can be laid down in this respect, and the new settler should be guided by the practice of the more prominent farmers in his neighbourhood. It may be stated, for the benefit of those quite new to cattle farming, that the cow carries her calf normally 283 days, or approximately $9\frac{1}{2}$ months, so that mating must be arranged accordingly.

Calving and the Care of the Calf.—It is not proposed to deal here with the process of calving. As a rule local cows require little assistance, but the new settler will be wise to take steps to gain some practical knowledge of this subject before taking cattle under his sole charge. One of the most frequent and common troubles in this connection is retention of the after-birth. This occurs most frequently in dry seasons, and may be largely avoided by the provision of plenty of succulent food to the in-calf cows for some time before calving. Cows in strong, healthy condition are less liable to this trouble than those which are poor and weak.

In countries in which dairying is more advanced and in which the cows are, as it were, more civilised, it is a common practice amongst cream and butter producers to remove the calf from the cow, either at birth or on the fourth or fifth day, and to raise the calf by hand on a ration composed of new milk and skimmed milk mixed, to which some substitute for butter fat has been added. A greater quantity of cream or butter fat is thus left available for sale, and it is quite possible under this system to raise healthy calves (see Bulletin No. 210, "The Care and Feeding of Calves in Dairy and Stud Herds"). Unfortunately the new settler will find a considerable difficulty, at any rate at first, in getting the class of cow he will buy to milk without her calf. A few of them may do so, but it is probable that he will have little success with the older cows, and will have to depend on training the heifers as they calve for the first time. While, then, hand feeding is recommended as a system to be adopted as soon as possible, it is recognised it will not be possible if loss of milk, owing to untrained cows, is not to result, and in such a case the old system of suckling the calf on the cow must be adhered to (see Bulletin No. 210, page 4).

It is the common practice with many dairymen to milk the cows once a day only, in the morning, the calf having been removed during the night, and to allow the calf to run with the dam all day. This is quite sound under some circumstances, but these notes are written

for the type of farmer who will be very largely dependent on his dairying for the first year or two, and who must work it for all he knows, tending both cows and calves in such a manner that milking twice a day can take place without material harm to either. It is an advantage with young calves, up to, say, three week old, to allow them to suck three times a day. On a new farm, for various reasons, this will entail a great deal of trouble, since usually all the cows will be herded together, and it will be inconvenient to bring any of them in in the middle of the day. Provided care is taken to keep the milk fresh and clean, and to see that it is always raised to the proper temperature before being given to the calf, it is quite possible to teach the calf to drink from the bucket in the middle of the day, and so get a third feed without its dam being disturbed. It should, of course, suck only from the dam until the milk becomes normal. By teaching sucking calves to drink from a bucket as well, a saving may often be effected by feeding skimmed milk or skimmed milk and some fat substitute on a large scale to the older calves, and merely allowing them to suck the dams sufficiently to make the latter give down their milk. Provided the settler keeps his calves in health, any butter fat saving of this kind is worth his consideration. Whatever system of feeding calves is adopted, the stripping of the cows after each milking should be strictly attended to, and special attention should be given to heifers with a first calf.

It is important that all cows should be milked punctually, at the same hours every day, in a quiet and careful manner. A shed on the lines described in Bulletin No. 243 will greatly facilitate the efficient treatment of cows at milking time. For information in regard to the gradual weaning of calves, the reader is again referred to Bulletin No. 210. It often happens in this connection that in the case of a calf that is sucking its dam the time has arrived when the calf is old enough to be weaned, but the farmer fears to do so, because the green grass of spring has not yet made its appearance, and the calf would have difficulty in digesting the old dry pasture. The result is that the calf is allowed to go on sucking a cow which has not enough milk for it, and which, in her effort to produce milk, is reducing her own strength and the strength of her unborn calf. This dilemma may be avoided by making provision beforehand of hay, ensilage, a little ground-nut fodder and so forth on the lines above mentioned, and by making ready, about June, a simple kraal or yard with a lean-to shed. Having made such provision, the moment a calf is seen to be falling off in condition, it can be weaned, irrespective of the season, and can be stall fed until such time as it has recovered strength and the grazing is good. At the same time its dam is released, and is given an opportunity of regaining her strength in good time before she is due to calve again. Should the calf be too young to wean, both the cow and the calf may be kept near the homestead and fed. Such care of the young calf will prevent the check of its growth which calves in this country often suffer at weaning time, and the writer is confident that the practice continued for a number of years would gradually so increase the stamina of the herd that the percentage of calves in each year requiring such treatment would be reduced to a minimum.

The Care of the Heifer.—Provided the heifers have been treated as above recommended, the great majority of them will be in strong growing condition, and should be mated at from 18 to 22 months of age. Should there be here and there a weakly one, she may be left until she is fully two years old, or has acquired normal condition and strength. The object of the breeder of dairy heifers is to develop their maternal qualities and to check their beef tendencies at as early an age as possible, without interfering with their growth. It will be seen that in grading up a dairy herd attention to this point is essential, since some of the heifers will undoubtedly have inherited tendencies to beef production from their mixed ancestry. Should a heifer shew a marked tendency to beef, she should be mated at the earliest age mentioned, but she should be allowed six months' rest after calving before being mated again, in order that she should not be carrying her second calf and be suckling a big first calf at the same time, and thus seriously check her own growth and development. Attention to the foregoing will necessarily be modified by consideration of the time of the year at which it is desired that the heifer should calve. A heifer born in November, for instance, will be 18 months in May, 22 months in September, and 24 months in November. According to the age at which she was mated, she would calve in February, June and August. A heifer born in March will be 18 months in September, 22 months in January, and 24 months in March, and will calve in June, October and December.

A consideration of this shews that with the first year's calves it will be wise to do them pretty well, so that they may be mated early and come along as winter milkers. In the case of the November heifers, they will be given six months' rest, and again come in as winter milkers with their second calf.

Treatment of the Bull.—This will depend very largely on the type of bull, whether pure-bred, imported or locally-bred, but as a rule the new settler will let the bull run with the herd (except at such times as it is undesirable that he should serve), and will feed him at night in a shed with or near the cows. When not in use, the bull must be housed and artificially fed and exercised, or be sent away with a number of in-calf cows. This is rather a difficult problem on a new farm, but it is so important that no effort should be spared to cope with it, and avoid heifers and cows coming to the bull at undesirable times. The writer would here emphasise the fact that no expense is too great which will assist to keep the bull, not fat, but in hard, strong, lusty condition. Especial attention in this direction should be given to young bulls.

Subsequent Selection.—The great question before the breeder in Rhodesia is how long one may continue to use a pure-bred bull on a grade herd without getting them too fine. However debatable a point this may be in regard to beef production, there is only one answer in connection with dairying, and that is, always use the best and purest-bred bull one can afford, and as the progeny become more highly developed, feed them more if necessary. With regard to the subsequent selection of the heifer, constitution must be the first considera-

tion. If she be very weedy, get rid of her at once, if possible; it will usually be wisest. In any case do not put her to a pure-bred or well-bred bull, but turn her out with the rough breeding herd, and let her be mated with a good strong Fries-Africander bull, or something of that sort. If the result of this cross shews improved constitution, it may possibly be worth while to bring her progeny back into the dairy herd. The second consideration is dairy type and milk production as against beef type and beef production. In the case of very beefy or coarse heifers, they may be sold or drafted to the beef herd, or they may be kept and mated very early. Such heifers may, when mated to bulls of extreme milk breeding, such as Friesland, Jersey or Ayrshire, produce heifers of strong milking qualities, although they may not shew signs of being good milkers until their second calf.

The following publications, which have been referred to in this article, are all obtainable free on application to the Director of Agriculture or the Controller of War Settlement:—

Department of Agriculture Bulletin No. 210, "Care and Feeding of Calves in Dairy and Stud Herds"; Department of Agriculture Bulletin No. 243, "Shedding for Milch Cows"; Department of Agriculture Bulletin No. 190, "The Principle of Winter Feeding of Dairy Cattle."

For valuable assistance in writing this article the writer is indebted to Mr. J. A. T. Walters, of the Agricultural Department, and Mr. C. Willmot, a practical dairyman on the granite veld in the Marandellas district.

Show Dates, 1918.

Bulawayo (Stock)—28th and 29th May.
,, (Produce)—29th August.

Gwelo—5th and 6th June.

Salisbury (Stock)—14th and 15th June.
,, (Produce)—22nd August.

Gatooma—19th and 20th June.

Umtali—27th and 28th June.

Rusape—19th and 20th July.

Natural Transmission of Trypanosomiasis

(*T. PECORUM* GROUP) IN THE ABSENCE OF TSETSE-FLY.

By Rupert W. Jack, F.E.S., Government Entomologist, Southern Rhodesia.

Reprint from the *Bulletin of Entomological Research*, Vol. viii., Part 1, August, 1917.

Note.—The manuscript of this article was sent to the Imperial Bureau of Entomology in January, 1917.

(Maps I. & II.)

The opinion that trypanosomiasis of the *T. pecorum* type is, under favourable conditions, transmissible amongst domestic stock through the agency of blood-sucking flies other than *Glossina* has been expressed by several observers.*

Observations in Southern Rhodesia during the past seven years have convinced the writer that, given the necessary conditions, transmission of this disease may take place in the absence of tsetse-fly, and that such transmission has occurred more frequently than has been generally recognised. It may be of interest therefore to give the facts concerning several outbreaks in the Territory which form a chain of evidence pointing to the above conclusion. The trypanosome was in each case diagnosed by Mr. Ll. E. W. Bevan, Veterinary Bacteriologist, Southern Rhodesia:—

I. *T.'s cattle.* Farm on railway about 3 miles N.E. of Gatooma. Season 1909-10.

Ten cattle were brought to farm about 26th October, 1909, from Victoria, but had been by rail to Salisbury and back to

*(1) Kinghorn & Montgomery: "A Report on Trypanosomiasis of Domestic Stock in N.W. Rhodesia."—*Ann. Trop. Med. Parasit.*, June, 1908.

(2) G. E. Owen: "Mechanical Transmission in Trypanosomiasis," —*Jl. Comp. Path. Therap.*, September, 1914. (The species of trypanosome in this instance is not certain.)

(3) H. Llewelyn Jones: "The Treatment of Trypanosomiasis in Cattle caused by the *Trypanosoma pecorum*."—*Jl. Comp. Path. Therap.*, June, 1915.

Gatooma. Two were brought to farm about 6th December. At the time of my visit, 31st January, the two latter were healthy; but the remainder, of which one had already died, were all "fly-struck," the first case having been noticed during the first week in January. The range of the cattle was confined to the farm, the road between the farm and Gatooma and across the railway to the Cam Mine. Fly is known to exist 3 to 5 miles to N.E. (see Map I.) The writer spent a full week looking for fly on this farm and in the vicinity, with negative results. A few specimens of *Tabanus* and a few *Stomoxys calcitrans* were seen about the cattle. Early in March the two remaining cattle fell sick and were diagnosed by Bevan as suffering from trypanosomiasis. Since that year cattle have lived in a healthy state on this farm.

II. *H.'s cattle.* Farm within 2 miles of Gatooma to S.E. Season 1909-10.

Forty cows were on the farm for sixteen months, and out of these nineteen shewed symptoms of trypanosomiasis (diagnosed by Bevan). The only occasion on which any left the farm was from August to November, 1909, when all but six went to the Inez Mine (opposite direction to the fly belt). The first case was recorded in July, 1909. *Stomoxys calcitrans, Lyperosia* sp. and two species of day-feeding mosquitoes were common about the range of the cattle. No tsetse was seen on or near this farm, and there was no subsequent reason to believe that "fly" occurs in the vicinity. Many cattle are used on the roads in and out of Gatooma, and if fly occurred the fact could not remain hidden.

III. *Chicago Mine.* S. bank of Msweswe River and about 5 miles E. of railway line. Season 1909-10.

Thirty-six oxen had been at work near the mine for two years, drawing crushing material from a shaft about a mile from the mine. The only time when any of them were away was when four oxen drew a Scotch cart to Gatooma and back about a month before Christmas, 1909. The first case was noticed in March, 1910 (diagnosed by Bevan). At the time of my visit, 6th April, five cattle had died, and at least ten more were "struck." *S. calcitrans* and *Lyperosia* sp. were extremely numerous about the cattle. The writer could find no sign of tsetse in four days, and there has been no subsequent reason to believe that fly occurs at this spot. Cattle have been working on other mines near by for years, but early in 1909 fly-struck cattle were brought to the Lydia Mine, which is only a short distance across the river from the Chicago, and may have initiated the outbreak. The nearest known fly belt is 12-15 miles distant in a straight line to the north.

IV. *M.'s swine.* Farm on N. bank of Umfuli River, on E. side of and adjacent to railway line. Visited on 15th November, 1911.

A number of sows had been on the farm for two years. The first death occurred on 15th October, 1911, and fifteen had died up to time of the visit, as well as one boar. A large number of young pigs on the farm were all healthy, and a number of cattle there also remained unaffected. *Tabanus taeniola* was very abundant on the cattle at the

time of the visit, but did not pester the swine much. *S. calcitrans* was abundant on the swine. This farm is about 10 miles from any part in which one would expect to see tsetse, but the fly was at that time probably carried occasionally close to Hartley, which is about 3 miles distant from the farm. The immunity of the cattle, apart from other facts, practically proves that something other than tsetse was responsible for the spread of the disease amongst the pigs.

(N.B.—Bevan is doubtful as to the trypanosome in the swine being identical with that affecting cattle in the district, but states that morphologically it belongs to the *T. pecorum* group.)

V. *S.'s and G.'s swine.* Adjacent farms on the Umfuli River. S.'s farm is also adjacent to M.'s. Date of visit, 29th January, 1916.

Of S.'s swine, three pigs were bought from M. and had remained on the farm since January, 1914. On 18th December, 1915, 32 sows arrived from East London. A sow from East London died on 15th November, 1915, and a second on the 27th, both being heavy in young. On 21st December, 40 pigs arrived from East London (35 sows and 5 boars). To that date, 19 heavy sows and 1 boar had died and 2 more died during the writer's visit, whilst several young pigs shewed symptoms of being "struck." Other pigs died subsequently. Cattle ranged on the farm over the same ground as the swine and all remained healthy. *Tabanus fuscipes* and *Haematopota* sp. were and had been very troublesome to the pigs since the commencement of the rains. *S. calcitrans* was moderately abundant, and the pigs were, of course, much infested with lice (*Haematopinus*).

G.'s pigs were obtained from S., and were exposed to similar conditions, and the outbreak took a similar course. Cattle also remained healthy on this farm.*

VI. *M.'s cattle.* Sikombella River, Sebungwe district.

In this outbreak the sequence of events is so clearly defined and the distance of the farm from any fly belt so great that it constitutes in itself a definite proof of the transmission of this form of trypanosomiasis in the absence of *Glossina.* The situation of the farm in relation to the fly belts in the district is shewn in the accompanying map (Map II.). The outbreak occurred in the 1915-16 season, and the history of the affected cattle is given by the owner as follows:—

"In September, 1915, four spans of oxen were taken to Sileya's kraal, and were employed in transport work between that kraal and Sikombella until 17th December. During October eight of these were taken by a Dutchman into the fly belt on the Sassame River—it may have been the Ensengwe River fly belt in the vicinity of the Sabala River (Bandala's kraal)—and on and off after that were in contact with the remainder of the four spans until 17th December.† After this they were running not only with the remainder of the four spans,

*The location of the preceding five outbreaks is indicated on Map I.

†The oxen returned with the wagons from Sileya's kraal to the Sikombella River in December.

but with all the cattle on Sikombella farm; the eight infected oxen were all dead by the end of December, one having died with the first rain at Sileya's on or about 15th November. At the middle of February some twenty head shewed sick, but the true cause was not suspected at that time. About 25th February a team of healthy-looking oxen, made up of 11 oxen which had been to Sileya's and five young oxen which had not previously left the farm, were inspanned and sent to Gokwe with a load in company with another team of sixteen, which had been to Sileya's and looked fit; two of these died on the road up, including one of the young oxen, and some six others became sick, including three of the young animals (these three subsequently recovered and are now working§). I now removed all sick animals to a camp about a mile away, but from time to time I had to keep adding an animal which shewed sick amongst the healthy herd. Towards the end of March two *old cows* and my bull (none of which had left the farm) became sick; the two cows quickly died, one leaving a very young calf, which is alive to-day; the bull has entirely recovered since. From the end of February the infected cattle were dying at the rate of two or three a week for two months, after which the death rate would be about one a fortnight until the end of September; some twelve head of infected cattle remaining at that date have recovered and are now working. Some thirty-six head have died, including the eight fly-struck animals; all these shewed typical fly sickness. With the exception of the eight oxen taken into the fly belt, none of my oxen have ever been in the vicinity of a fly belt, having only travelled the main road between Sileya's kraal and Que Que; also the main road between Sikombella Farm and Pondo Mine (years ago)—Mr. Luxat's."

Cattle had been living in a healthy condition on this farm and near by for years. The writer visited the locality in August, 1916, and after exploring the vicinity for three days on the possibility of fly having "come down" to the farm from the belt to the north, travelled down the Gwanyika River and down the Umniati to ascertain if any movement of the fly had taken place. No fly were encountered until the spot was reached where its southern limit on the Umniati River was marked in 1914. From the Umniati the return journey to Gokwe was made *via* the Mtanka River, all the country traversed, as on previous occasions, proving free from fly.

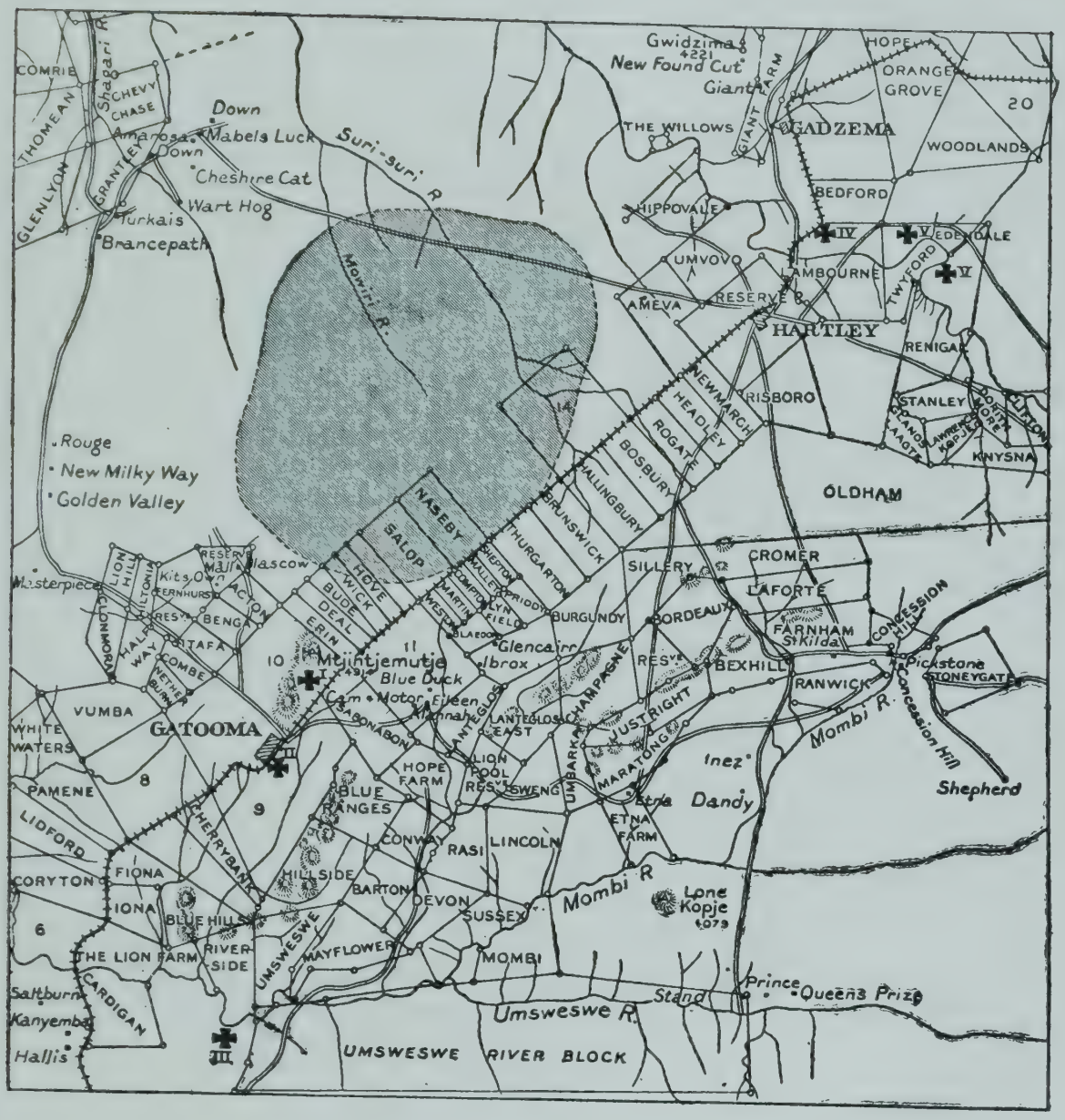
The following points are noteworthy in connection with the cases cited above:—

(1) In all cases the outbreak attained its height during the spring and summer months (October-April).

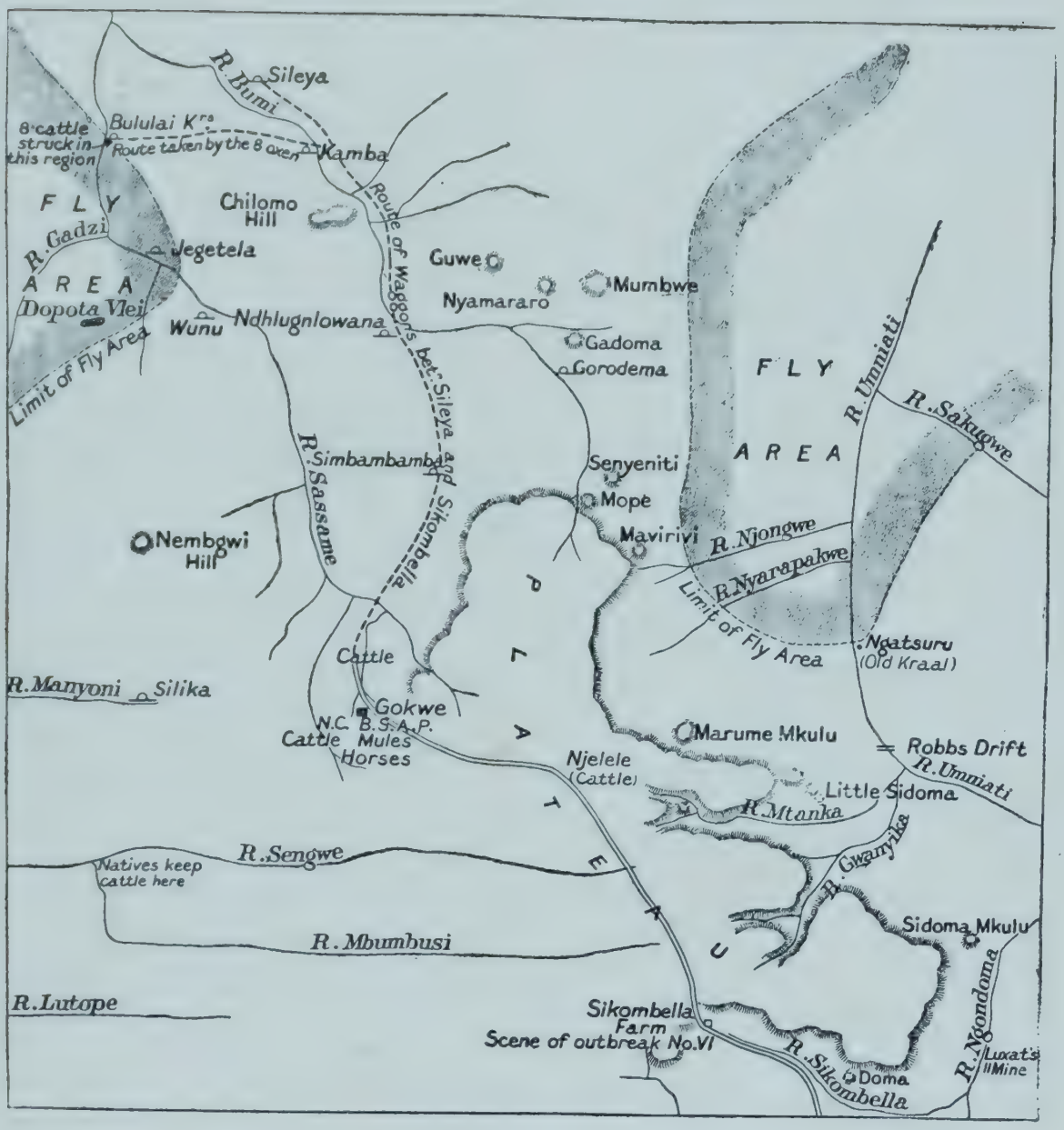
(2) In all cases, in connection with which sufficient time has elapsed for such observation, there has been no recrudescence of the disease in the following season, although susceptible animals have still been kept in the same locality.*

§The disease was diagnosed by Bevan from smears taken from these three oxen.

*This is, of course, contrary to the experience in Barotseland and Portuguese East Africa.


Gwidzima 4221
New Found Cut
Giant Farm
HOPE
ORANGE GROVE
20
COMRIE
Shagari R.
CHEVY CHASE
THOMEAN
Down
Amarosa Down
Mabels Luck
Suri-suri R.
THE WILLOWS
GADZEMA
WOODLANDS
GLENLYON
GRANTLEY
Cheshire Cat
Wart Hog
Turkais
Brancepath
BEDFORD
HIPPOVALE
IV
V
EDENDALE
UMVOVO
LAMBOURNE
TWYFORD
VI
Mowire R.
AMEVA
RESERVE 8
HARTLEY
RENIGA
NEWMARCH
HEADLEY
ROGATE
BOSBURY
HALLINGBURY
RISBORO
STANLEY
DORA MORE
UNION
LAWRENCE KOPJE
KNYSNA
Rouge
New Milky Way
Golden Valley
NASEBY
SALOP
BRUNSWICK
THURGARTON
OLDHAM
SILLERY
CROMER
LAFORTE
Masterpiece
Glasgow
HOVE
WICK
BUDE
DEAL
ERIN
BURGUNDY
BORDEAUX
FARNHAM
St Kilda
CONCESSION HILL
BENGAL
TAFA
Mtjintjemutje
Blue Duck
Glencairn
Ibrox
BEXHILL
Pickstone
STONEYGATE
RANWICK
Concession Hill
Mombi R.
VUMBA
GATOOMA
WHITE WATERS
Cam
Motor
Eileen
Hannah
CHAMPAGNE
JUST RIGHT
MARATONGA
Inez
Etna
Dandy
ETNA FARM
PAMENE
LIDFORD
HOPE FARM
BLUE RANGES
LION POOL RES.
SWENG
CONWAY
RASI
LINCOLN
CHERRYBANK
CORYTON
FIONA
IONA
HILLSIDE
BARTON
DEVON
SUSSEX
Mombi R
Lone Kopje
1079
BLUE HILLS
THE LION FARM
RIVER SIDE
UMSWESWE
MAYFLOWER
MOMBI
Prince
Queens Prize
Stand
Saltburn
Kanyemba
CARDIGAN
Umsweswe R.
Hallis
III
UMSWESWE RIVER BLOCK

Map I.


R. Bumi
Sileya
8 cattle struck in this region
Bululai Kraal
Route taken by the 8 oxen
Kamba
Chilomo Hill
Route of Waggons
F L Y
A R E A
R. Gadzi
Vegetela
Dopota Vlei
Wunu
Ndhlugnlowana
Limit of Fly Area
Guwe
Nyamararo
Mumbwe
Gadoma
Gorodema
F L Y
A R E A
R. Ummiati
R. Sakugwe
R. Simbambamba
R. Sassame
Nembgwi Hill
Senyeniti
Mope
Mavirivi
R. Njongwe
R. Nyarapakwe
Limit of Fly Area
Ngatsuru (Old Kraal)
Cattle
R. Manyoni
Silika
Gokwe
N.C. B.S.A.P.
Cattle Mules Horses
P L A T E A U
Marume Mkulu
Robbs Drift
R. Ummiati
Njelele (Cattle)
Little Sidoma
R. Mtanka
R. Gwanyika
R. Sengwe
Natives keep cattle here
R. Mbumbusi
Sidoma Mkulu
R. Lutope
Sikombella Farm
Scene of outbreak No. VI
R. Sikombella
Doma
R. Ngondoma
Luxat's Mine

Map II.

(3) In all cases infection occurred only amongst animals that were herded together.

From the foregoing it appears probable—

(a) that the transmitting agent or agents are abundant in the spring and summer, and disappear or decrease greatly in number in the winter;

(b) that the disease is not readily transmissible under Southern Rhodesian conditions by these agents from chronic cases that live over until the rains or recover;

(c) that the agents concerned in this method of transmission are not capable of perpetuating the disease indefinitely, or are only capable of doing so under exceptional circumstances;

(d) that the method of transmission is of a mechanical and not of a cyclical nature;

(e) that the segregation of infected animals (on shewing temperature) would, in the absence of tsetse, effectively check the spread of the disease.

Allowing for the moment that the deduction given tentatively under (a) is correct, very few species of blood-sucking Diptera are eliminated by this statement, as, apart from *Glossina morsitans* and certain species of *Hippobosca*, all the common blood-sucking flies are very much scarcer in winter than in summer. Moreover, observation as to the prevalence of possible transmitting agents in the locality of the outbreaks furnishes a number of different species as likely subjects for experiment. The most probable agents are included in the following: *Tabanus fuscipes*, *T. taeniola*, *Haematopota pertinens*, *Haematopota* spp., *Stomoxys calcitrans*, *Lyperosia* and mosquitoes. Of these it must be admitted that *S. calcitrans* and mosquitoes are the only agents that are everywhere abundant throughout the season over which infection extends. It is, however, by no means necessary to infer that the power of mechanical transmission is confined to one species or to one family; and in view of Mitzmain's failure to associate *S. calcitrans* with the transmission of surra in the Philippines, it appears unlikely that this species is solely responsible in regard to the present disease. The whole matter calls for careful experiment and investigation.

With regard to (b) and (c), these deductions are fully borne out by experience in this Territory where fly-struck cattle have been freely moved into fly-free areas in the past. These movements have not resulted in *establishing* trypanosomiasis in any area away from the fly belts. If this method of transmission can continue freely and indefinitely, it is difficult to understand why the disease has not by this time become generally spread throughout the continent.

In no instance as yet recorded in Southern Rhodesia, however, can *Glossina* be definitely disassociated from the *inception* of the outbreak. The main point is, that the herding of "fly-struck" cases with healthy animals is a practice attended with danger, especially in the spring and summer months.

Dried Potatoes for Export.

THE PROSPECTS OF A NEW INDUSTRY.

By Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.

The possibilities of growing potatoes cheaply and in great quantities in Southern Rhodesia have been fully demonstrated. As in other countries, so with us, potatoes are readily grown at certain seasons of the year, but our local markets being limited, there is no inducement to produce anything beyond a certain amount, and seasons of scarcity with unduly inflated prices intervene. From December to March potatoes are cheap and plentiful. The storage of potatoes in our warm climate also presents difficulties. Again, it is notorious that potatoes from certain of our vlei lands, where they grow luxuriantly and yield abundantly, are yet such poor keepers that they cannot travel comparatively short distances even to markets within the country. Though for such products, if exported, prices equal to those obtained in our own limited markets cannot be expected, yet for potatoes cheaply produced in great quantities there might be a margin of profit sufficient to attract production, especially if the cheapest methods can be applied.

Last year a demand suddenly arose at Home for potatoes, and an export from the Cape commenced, but now we are assured officially that this season potatoes are not wanted. In any case, to send fresh potatoes from Rhodesia is impracticable. These circumstances led to enquiries being made as to the possibility of finding a market for conserved potatoes. For many years preserved vegetables from Germany and elsewhere have been used, even in Rhodesia, and it was thought that the tables might now be turned. Enquiries were therefore instituted, with results now published, after much delay owing to exceptional difficulties of communication.

The accompanying information has been compiled from various sources, largely through the British South Africa Company in London, and with the help of the Department of Overseas Trade, the Board of Trade Commercial Intelligence, the Board of Agriculture, the Food Production Department, the British Customs authorities, the British Empire Resources Development Committee, and not least His Majesty's Trade Commissioner for South Africa.

The United States of America produce very large quantities of potato starch, which is largely used for laundry starch, gums

and farinaceous products, also potato flour used as a soup thickener and in cooking generally. On the continent potato dehydrating factories are found most highly developed in Silesia, though they are not uncommon elsewhere. The product is extensively used for household purposes, much more so than in England. There is, however, an established and growing import trade in Great Britain mainly for ships, but also to some extent for hotels and domestic consumption. At present the demand greatly exceeds the supply, and of course the great bulk goes to the army. Vegetables other than potatoes are perhaps beyond our present capabilities, as they have to be packed in air-tight cases, but it is of interest to note that all classes, such as turnips, carrots, cabbage, peas, celery and tomatoes, can be successfully preserved in this way.

The accompanying table of imports of dried vegetables into the United Kingdom is interesting, as shewing a considerable, if irregular, increase in the years preceding the war and remarkable progress from 1914, especially from countries which before had been grouped together as being of much less importance than Germany and Belgium (which now send none), or Holland and France, which even in these days still continue to supply British needs. The great increase, however, of late is from British possessions, though which it is not specified, and it is to be hoped this country may be able to add its share to these Imperial supplies, and that these may afterwards be continued in place of the foreign article. Dried potatoes are included in these returns, and are not separately recorded.

UNITED KINGDOM DRIED VEGETABLE IMPORTS.

	1912. Cwts.	1913. Cwts.	1914. Cwts.	1915. Cwts.	1916. Cwts.	1912. £	1913. £	1914. £	1915. £	1916. £
Germany ...	3,310	2,618	1,312	...	...	5,719	5,702	2,934	...	...
Netherlands ...	539	744	3,875	2,341	2,555	1,082	1,405	12,982	12,005	9,468
Belgium ...	871	805	353	...	...	1,906	2,042	1,453	...	...
France ...	1,834	869	1,279	1,042	560	6,556	1,897	3,875	3,206	1,472
Other foreign countries ...	1,686	467	459	4,575	3,366	3,177	679	1,123	19,227	24,442
Total from foreign countries ...	8,240	5,503	7,278	7,958	6,481	18,440	11,725	22,367	34,438	35,382
Total from British possessions ...	135	113	...	14,708	6,015	148	99	...	53,752	27,492
Total ...	8,375	5,616	7,278	22,666	12,496	18,588	11,824	22,367	88,190	62,874

Home buyers, not unnaturally, ask us for samples immediately. This we cannot furnish, as our enquiries were of a preliminary nature. The following figures are instructive both as to present exceptional opportunities and normal pre-war prices:—

	Approximate price at present.	Per long ton pre-war.
Desiccated potatoes	£77 10 0	£18 0 0
Dried turnips	115 0 0	55 0 0
Dried onions	290 0 0	80 0 0
Dried carrots	115 0 0	55 0 0

Freight rates are a variable factor, and future transport costs cannot yet be foreseen. As dried potatoes are only about one-sixth of their original weight, it would take six tons of fresh potatoes here to be worth in ordinary times £18 in England, that is, £3 per ton of 2,240 lbs., or about 15 bags of 150 lbs., which is only 4s. per bag. Against this may be set the facts that the world's market is available, not the limited local one, and that at certain seasons potatoes can be very cheaply produced. Moreover, culls, after the table potatoes have been picked out, may quite usefully be dried, so the value should be compared with the former, not the latter.

The underlying principle of preservation by desiccation is that when the water content, which in potatoes is normally about 78 per cent., is reduced below 12 per cent. or thereabouts, the action of enzymes or bacteria which produce decomposition is inhibited, as these require a moist medium in which to develop.

The special advantages of dehydration over cold storage are economy of space and reduction of weight, affecting both transport and accommodation, saving of cost of cool chambers and iced cars, freedom from risk of failure of cooling plant during transit or whilst awaiting consumption, and finally the indefinite time desiccated goods remain good in bulk or whilst in the shop or pantry, as against the rapid deterioration of goods when taken from cold storage. The flavour and texture of dried vegetables and fruit are undiminished.

In this connection, an interesting comment amongst the information obtained in these enquiries, and one which may yet have a wide application in Rhodesia, is that a demand exists to-day in London for desiccated citrus fruits, and, if the supply of dried oranges could be assured, this demand would be increased. It is stated on the authority of the Journal of the Royal Society of Arts that powdered dry orange is as fragrant as the fresh fruit.

No doubt it would be possible successfully to dry sweet potatoes, in which inulin replaces starch, and a market found for this commodity when presented in a dry and non-perishable form. The yield per acre of sweet potatoes is, of course, much greater than that of the ordinary potato, and they are much more easy to grow.

The processes of drying potatoes are, first, naturally, where the climatic conditions allow; secondly, by moderate artificial heat under a

reduced atmospheric pressure, vacuum drying; third, desiccation by heated air currents; and, finally, by a process of steaming, grinding and desiccation between hot rollers. Obviously, if a system of air drying can be successfully adopted, much capital outlay is avoided, and this may be the most profitable means of solving the problem, even if the resulting article is not as high priced as that prepared in the more elaborate factory. To this end, advantage might be taken of the dry season in South Africa, and all that is required is such simple arrangements as can be devised on the farm for washing the tubers free from all earth, slicing to a thickness of about three-sixteenths of an inch, drying on racks of wire gauze or washed Hessian, preferably perhaps out of the direct sunlight, though this is uncertain, and finally packing the chips in suitable receptacles for export, for it is of the utmost importance to keep the final product dry.

The well-known engineering firm of Messrs. James Milne & Son, Ltd., Milton House Works, Edinburgh, have gone into the question fully, and courteously furnished the suggestive information given below. Incidentally, it may be mentioned that they are supplying a number of potato-drying plants to the Food Production Department in England.

"The process consists in cooking the washed potatoes by steam and passing them, after a rough crushing process, over a special type of drying machine, where the entire potato (meal, skin and all) is dried and delivered in a very fine flaked condition. This was undoubtedly the process most in vogue and most in favour in Germany, and a lot of the potato flour so made was imported into Great Britain. The cost of fuel for drying is a considerable item, yet the value of the finished product makes the expense worth while."

Dealing with an installation designed for this purpose, Messrs. Milne & Son proceed as follows:—"The potato reception hopper is set in the wall of the house so as to be loaded either from carts out of door or from reserves stored in the building. The exit orifice of such a hopper is fairly low, and there is a short slop conveyor that lifts the potatoes a few feet and delivers them at a uniform rate into the 'swim canal,' which is the first stage in the washing process. This 'swim canal' is, say, 2 feet wide and 2 feet deep, with a U-shape bottom and about 100 feet long, or longer if practicable. It has a fall of less than 1 per cent., and a good flow of water enters with the potatoes, which rumble down the gentle incline and part with far the greater part of their sand and dirt. At the end of the canal is a grating through which the dirty water and sand escape, and the potatoes shoot down into a rotary washer with a horizontal shaft. This vat has four partitions with holes in each through which the potatoes pass, and revolving wood arms agitate them constantly in their transit from end to end of the machine. This effectually completes the washing process, and (as is most important) stones remain in the bottom of the trough and do not in any circumstances come through with the potatoes. When the potatoes come from this machine they are taken up a slope elevator and conveyor, which distributes to hoppers over the cookers and drying machines. The cookers are arranged in duplicate over each

drying machine. They are of such size that while one is being steamed to effect the cooking, the other serves as a reservoir of cooked potatoes from which the machine is uniformly fed. As the cooked roots emerge from the steaming vessels they are roughly crushed between small rollers, and then pass between two much larger steam-heated cylinders, which run practically in contact one with the other; the film adhering to each cylinder dries in the course of about half a revolution, and is removed by sharp knives, or 'doctors' as they are termed. The drying cylinders are worked at a pressure of about 80 to 90 lbs. per square inch, and require to be a very special mixture of irons to be sufficiently hard and yet strong enough to resist the pressure. The flake from the drying machines is milled and sifted to remove the peel, which commands a good price as a cattle food.

Now, the question of the commercial success of such a factory depends mainly on these variables:—(1) Cost of potatoes, (2) the proportion of solids in the potatoes, (3) cost of fuel, (4) cost of packing, conveyance and selling, and (5) the price obtainable. All these figures are very uncertain at the present time. In the spring of 1915 we made out an estimate of probable cost of production, using one or more machines. In these estimates we allowed for the washers and elevators being big enough for the addition of further machines up to four. We give a copy of the report upon results arrived at at that date.

Potato Flour.—The yield of our drying machines when producing potato flour seems to be as follows, all in tons per 60 hour week, and making allowance for varying amounts of solid material per ton potato.

No of Machines.	Raw Potato.	Solids 15 per cent.			Solids 20 per cent.			Solids 25 per cent.		
		Flake.	Flour.	Peel.	Flake.	Flour.	Peel.	Flake.	Flour.	Peel.
One	45	6·75	5·40	1·35	9·00	7·20	1·80	11·25	9·00	2·25
Two	90	13·50	10·80	2·70	18·00	14·40	3·60	22·50	18·00	4 50
Three	135	20·25	16·20	4·05	27·00	21·60	5·40	33·75	27·00	6·75
Four	180	27·00	21·60	5·40	36·00	28·80	7·20	45 00	36·00	9·00

(Tons per 60 hour week.)

Shorthorn Bull, Kelmscott Juggler, 60th (vol. 63); sire Trickster 4th, 118058; dam Noblesse 36 (vol. 60), by Cranford Freemason, 114883; bred by Messrs. R. W. Hobbs & Sons, Kelmscott; property of Captain E. Tryon Wing, Rustington, Shamva. A red and white dairy type; photo at ten months.

We are proceeding on the supposition that 15 per cent. of solids is the worst proportion that is recoverable from the raw potato. We estimate the capital cost of the plant as follows:—

	No. of machines. One.	Two.	Three.	Four.
	£	£	£	£
All new machinery, shafting, etc., but taking no value of existing boilers, which would be utilised	1,000	1,300	1,600	1,900
Building necessary, *new*, say	500	500	600	600
	£1,500	£1,800	£2,200	£2,500

The working costs may be expected to be as follows, per year—25 weeks of 60 hours equals 1,200 hours day shift:—

	No. of Machines. One.	Two.	Three.	Four.
	£ s.	£ s.	£	£
Machinery, 5 per cent. interest on capital ...	50	65	80	95
,, ,, depreciation ...	50	65	80	95
Buildings, ,, interest on capital ...	25	25	30	30
,, 2½ per cent. depreciation ...	12 10	12 10	15	15

	No. of Machines. One.	Two.	Three.	Four.
	£ s.	£ s.	£ s.	£ s.
Standing charges	137 10	167 10	215 0	235 0
Coal to [illegible] and dry ...	168 15	337 10	506 5	675 0
Power	70 0	100 0	128 0	156 0
Labour	262 10	306 5	350 0	393 15
Potatoes, at £2 per ton ...	2,250 0	4,500 0	6,750 0	9,000 0
Sundry costs	111 15	138 15	200 15	240 5
Estimated operating cost, 25 weeks of 60 hours, annually	3,000 10	5,550 0	8,150 0	10,700 0

Repeating the foregoing figures, the expected operation costs per season are:—

	No. of Machines. One.	Two.	Three.	Four.
	£ s.	£ s.	£ s.	£ s.
Operating costs	3,000 10	5,550 0	8,150 0	10,700 0
Yield at 15 per cent. solids, tons—Flour	135	270	405	540
Peel	34	68	102	136
Cost per ton of flour altogether, neglecting value of peel	£ s. 22 4	£ s. 20 11	£ s. 20 3	£ s. 19 16
Yield at 20 per cent. solids, tons—Flour	180	360	540	720
Peel	45	90	135	180
Cost per ton of flour, neglecting value of peel ...	£ s. 16 12	£ s. 15 8	£ s. 15 2	£ s. 14 17

	No. of Machines.			
	One.	Two.	Three.	Four.
Yield at 25 per cent. solids, tons—Flour	225	450	675	900
Peel	56	113	170	226
Cost per ton of flour, neglecting value of peel ...	£ s. 13 7	£ s. 12 7	£ s. 15 2	£ s. 11 18

It will be seen also that the cost of potatoes is 75 per cent. to 85 per cent. of the whole working costs. It will be seen also that the yield of solids per ton of potatoes is a vital point. With 25 per cent. of solids, the case would be rather better even than the table shews, as there would be less water to evaporate and a certain but not large economy in fuel. With 25 per cent. of solids also, three machines are sufficient for the full annual output of 500 tons of flour. We may say in this report coal was taken at 15s. per ton.

We would gladly put together figures for any special conditions, but these given may possibly be varied to give an indication of results to be expected in certain circumstances. It must be noticed that new buildings, new boilers, engines, etc., not duly allowed for in these figures will add to the capital cost, but not enormously to the cost per ton of flour. Probably 20s. per ton on the product would repay all charges for the items named.

So far as we can ascertain, the current market price of the flour in this country at the time of the outbreak of war was about £25 per long ton. The peel was not sent out of Germany, but we are informed that here it would itself have commanded about £15 per ton as a cattle food."

The figures contained in the above interesting statements are, of course, susceptible to modification to suit the conditions of Rhodesia, and considerable re-calculation would be necessary. Moreover, costs are at the present time subject to great fluctuations. It is not imagined that, while the war continues, active steps could be taken to erect such a plant, but in any case the figures are most helpful as shewing the basis of calculations of this kind, and indicating the scale of operations necessary for industrial success where modern machinery is called into operation.

Messrs. L. Lumly & Co., Ltd., The Minories, London E 1, recommend the system of evaporation by means of their "Invicta" fruit and vegetable dryer and evaporator. Where simple air drying is not feasible, this method has its uses, and is well suited for experimental work, in that the machinery is made in five sizes, from about 400 lbs. weight up to 9,500 lbs., and at prices which in normal times in England varied from £18 to £160. This evaporator consists of a furnace for heating air which passes through an inclined chest or frame filled with trays on which are laid the potatoes, fruit or vegetables to be treated. The greatest heat is concentrated upon a tray when it first enters the machine, and each tray subsequently introduced pushes the previous one forward into a lower temperature. It is claimed that no steaming or cooking thus takes place, and the circulation of dry, hot air ensures rapid desiccation of the outside, so that colour and flavour are un-

impaired, and burning or scorching is precluded. By this process thin-sliced potatoes could be rapidly transformed into a hard, dry, light form which would keep and bear freight to distant points for further manufacture or consumption.

Before giving definite quotations, the makers of this class of machinery necessarily desire to know the number of tons of potatoes to be dealt with in a given time (preferably twelve hours per diem, or sixty hours per week), the conditions of working, the climatic temperature under which the work will be carried out, and so on, and particularly the quantity of moisture in the potatoes, as upon these data their calculations and the construction of the plant depend. It is usually considered that such a factory runs only for certain months in the year, and must be very fully employed during such a "campaign," as it is idle for the rest of the season, hence long hours during the working period are expected.

Whilst certain processes have been detailed, it is only fair to say that there are many others, duly protected by patents, such as those of Geo. H. Benjamin, New York, and the Alliance Vegetable Co., Ltd., London. The latter firm have offered to dispose of their patent rights for Rhodesia, but as they do not furnish particulars which might enable an opinion to be formed of the value of such a purchase, further negotiations are unlikely.

A point requiring investigation is the amount of moisture usually found in our potatoes as they would ordinarily be furnished to such a potato-flour factory, and this is a matter for our chemists to determine by the examination of a number of typical samples. The relative merits of our red soil and black soil and vlei land potatoes could thus be ascertained.

Without being unduly optimistic, it may be said that the possibilities of such a project warrant the careful scrutiny of farmers. They might combine, like the dairy farmers in the Union have done, and erect such plants at convenient centres, or they might enter into agreements to produce for a manufacturer, as is done by the sugar growers. Estimates and prices after the war cannot be foreseen or calculated upon, and the matter can only be considered at present on its general merits and in a reasonable way as a practical proposition.

Meantime, on an experimental scale, there seems no reason why small trial lots of potatoes should not be washed, sliced and desiccated by an air current under shade during our dry winter season and packed. If any farmers will try this plan and forward samples to the Department of Agriculture, efforts will be made to obtain opinions from competent sources thereon as a guide for the future. A trial will also be made on these lines at the Gwebi experiment farm.

No immediate outlet can, under existing conditions, be looked for, but it is well to be prepared with all possible information to take advantage of an outlet if it is found to be warranted and at the first opportunity. If by a simple "home-made" process an article profitably marketable can be prepared, even if it is not as high priced as if prepared by the processes which involve elaborate and expensive machinery, it may yet be more within our reach and capacity.

Report on Experimental Forestry

AT THE RHODES ESTATE, MATOPOS.

By W. E. Dowsett, F.R.H.S., Curator.

The work as originally laid down in the Matopo Park was abandoned after a period lasting some eight years. It was felt that the site would not in any way be "improved" by the introduction of exotics. Another factor which led to the abandonment of the original scheme was the unsuitability of the site for experimental forestry, due (1) to shallowness of soil, with granite rock outcropping continually; (2) to its location on a large watershed, falling away on both sides some hundreds of feet; and (3) to a considerable section of the area being lacking in humus. At the time it was agreed that those trees standing should be allowed to remain, if they were not of too conspicuous a feature in the landscape. Taking the site as a whole the results can hardly be called a fair criterion of the suitability, or otherwise, of the trees dealt with, as the conditions were too exacting. If the planting happened to be followed by a dry spell, water had to be carried up to a distance of three miles; whilst, owing to the rocky nature of the ground, it was only possible to prepare one of the plantations by ploughing. Most of the planting, therefore, was done in pits, a very expensive method.

In 1913 it was decided that in future the work should be carried out in a more suitable situation, and a site was selected near the Maleme River, where the soil was of very fair quality, had good depth and permitted of ploughing from end to end, whilst the water supply was perennial, and the site was easy of access by the public. The drawback to this selection has proved to be the severity of the frosts, 22 degrees having been registered nearly every year since the work was transferred, and this has naturally precluded the trial of the more tender species, but these are being experimented with in a more sheltered spot where frosts rarely exceed 8 to 10 degrees.

The following table gives the rainfall for the past 13 seasons:—

Season.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	Total.
1904 5 ...	...	...	...	1·24	1·2	2·77	3·28	5·69	5·27	·03	·03	...	19·51
1905-6 ...	·05	...	·06	...	1·06	1·94	5·35	4·24	3·97	·13	·05	...	16·85
1906-7 ...	...	...	3·01	3·47	5·59	5·22	3·56	6·38	·94	2·88	·07	·02	31·06
1907-8 ...	·34	...	...	1·57	6·26	6·08	4·55	3·44	2·15	·18	·02	...	24·59
1908-9 ...	·3	...	...	·26	4·19	·93	9·85	2·73	3·74	·12	·04	...	22·16
1909-10 ...	...	...	·01	1·91	·79	7·25	1·35	4·27	4·68	...	...	...	20·26
1910-11 ...	·17	...	...	2·18	1·45	3·98	10·84	5·13	2·16	·49	1·26	·05	27·71
1911-12 ...	...	·01	...	·45	2·89	3·73	4·46	2·47	·51	·44	·64	...	15·60
1912-13 ...	·02	...	·09	·06	·37	·85	2·47	5·92	·4	3·12	·39	...	13·69
1913-14 ...	...	...	·32	·8	1·78	·82	1·99	5·35	·06	·41	...	...	11·53
1914-15 ...	·03	·17	...	...	2·93	14·72	23·20	3·8	3·25	·92	·61	...	49·63
1915-16 ...	·05	...	·45	1·05	·95	2·83	3·03	·09	3·02	1·8	·06	...	13·33
1916-17 ...	...	...	...	·02	1·77	7·55	1·18	1·27	·57	2·51	·33	...	15·23

The rainfall is shewn from July to June, instead of from January to December, so that the amount of precipitation for each season may be seen at a glance.

From a careful study of the records available, it appears that when the majority of the rains come from the east the fall will be slight for the season, particularly in Matabeleland; also that, unless good thunder and lightning storms are experienced, the fall will be below the normal.

The following table gives the mean temperatures for the years 1904-1917:—

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
1904 ...	72·7	71·9	68	67·8	62·8	59·1	56·9	63·2	65·2	72·2	74·8	71·1	67·1
1905 ...	73·7	71·7	67·7	58·7	61·4	59·7	55·9	63	70·30	76·8	70·7	75	68·5
1906 ...	74	65·4	65·6	61·6	59·3	52·2	51·6	57·7	65·8	66·9	68·1	72·3	63·4
1907 ...	70·9	72·08	68	63·5	62·6	54·4	51·9	57·1	65·1	73	71·6	70·5	64·5
1908 ...	73·3	70·9	68·8	64·8	59·1	58·7	56·2	62·2	69·7	73·05	70·8	72·1	66·63
1909 ...	70·7	69·5	67	63·18	59·4	57	56·6	63·1	67·2	71·9	72·5	72·1	65·8
1910 ...	72·7	70·8	68·9	63·8	57·7	55·4	54·4	62·7	66	69·2	69·2	71·9	64·9
1911 ...	69·9	68·9	64·7	64·1	58·1	51·8	52·3	57·2	62·7	71·7	72·2	75·5	76·91
1912 ...	71·7	72·3	67·9	68·7	64·7	54·3	53·6	57·7	64	70·2	78·2	74·2	66·4
1913 ...	75·7	73·1	75·1	66·8	61·4	55·06	59·6	64·4	72·3	75·38	78·38	80·4	69·77
1914 ...	77·43	71	71·06	71·9	64·1	59·63	56·8	60·2	72·14	77·46	77·7	72·4	69·31
1915 ...	72·8	70·6	67·6	67·6	60·3	56·8	59·2	61·8	68·2	65·2	77 3	78	67·11
1916 ...	77	79·4	75·6	69·2	63·9	60·9	62·4	63·7	72·5	77·4	74·03	71·6	70·63
1917 ...	72·2	72·5	70·3	66·9	63·8	57·6	56·8	61·6	69·8	77·6	75·2	69·4	68·64

It is a great mistake to try and grow here exotics from countries the climate of which is quite unlike that of Rhodesia. It is only a waste of time, money and energy, for at the best the results can only be disappointing, and regrets for failures are misplaced. It is only to be expected that failure will result from planting a tree here that has its habitat, say, on a narrow coast strip on the Pacific slopes; yet it is a common occurrence to see planters endeavouring to get trees to adapt themselves to an entirely different environment, where rainfall, altitude and temperatures all differ greatly from the country of origin. Even when a tree survives such conditions for any appreciable period, the growth can only be mediocre and the wood valueless.

In planting out in this Territory it is advisable only to use good strong transplants. Sowings *in situ* are almost invariably non-successful, and seedlings are too tender to withstand the heat. After the plants are put out, it is advisable to give them a watering to "set" them, but if raining when put out this is not necessary. I have found that, if the weather turns warm, a mulch of grass or leaves placed round the base of the plant is a great protection, besides conserving the moisture. In watering afterwards, it is a good plan in hard ground to make a hole at the side of the plant about large enough to admit one's hand up to the wrist, and fill this up with leaves or some other mulch, thus the water gets where it is wanted, and keeps the roots down at their proper place. Care must be taken that the plants are not set too deeply, otherwise many losses will occur from rot; they should be planted at the same depth at which they stood in the tins.

The following notes are regarding trees that have been tried here, mostly on the granite sand:—

Aberia caffra (Kei Apple, S. Africa).—Makes a most excellent cattle-proof fence; fruit makes good jam; has done very well here; has thorns about 3 inches long.

Acacia arabica (N. & C. Africa).—Has not done well. *A. acuminata* (W. Australia).—Failed. *A. Baileyana.*—Is doing very well on the loamy soil, but not on the sand; a very handsome variety and should be largely planted on suitable ground. *A. cyclopis* (S.W. Australia).—Failed; is apparently only a coast tree. *A. cultriformis.*—Doing very well so far; handsome small tree with yellow blossoms. *A. decurrens* (Black Wattle, Victoria and N.S. Wales).—Has not done well; failed after four years; apparently requires mists to thrive; may do well in certain parts of Mashonaland. *A. melanoxylon* (Blackwood, S.E. Australia).—Failed; fails in dry localities in Cape and Natal. *A. tomentosa.*—Failed.

Acer negunde (Box Elder of N. America).—Grows to a height of 50 feet; has only made stunted growth here (on the sand).

Agave americana (Aloe, Central America).—This and closely allied varieties do very well; are very hardy, and, apart from any economic value, are useful for transforming bare stony ridges, etc., into attractive spots. There are many indigenous varieties that can also be put to this purpose. *A. rigida* (Sisal, Yucatan).—This is very useful for scenic purposes, but in Matabeleland the cold is too great for it to be

grown for commercial purposes; perhaps in Mashonaland the milder climate may admit of this being done.

Ailanthus glandulosa (Tree of Heaven, S.E. Asia).—Growth here indifferent.

Albizzia lebbek (Siris Acacia, N. Africa and S. Asia).—Has done very well; makes a magnificent avenue tree; is almost evergreen here and gives splendid shade; I should say about the finest tree for an avenue that can be imagined for this country.

Aspidosperma quebracho (Red Quebracho, Argentine).—Is doing fairly well on the heavier soils, but not on the sand; has a very hard durable timber.

Bambusa vulgaris (Bamboo of Bengal).—Is doing very well on the sand, even where it is dry; very useful for making light ladders and farm buildings. There are several other varieties that should do equally well.

Brachychiton acerifolius (Flame Tree, E. Australia).—Has not done too well; too cold. *B. populneus* (Curriyon, Gippsland to Queensland).—Not doing well on sand, but is promising better on the heavier soils. This tree is sometimes known as *Sterculia diversifolia.* In Australia it is valued as a fodder tree in time of drought.

Bauhinia sp. (S. Africa).—The Rhodesian varieties are valuable for scenic purposes, especially the gorgeous scarlet one; the purple (*B. purpurea*) is delicate to severe frosts.

Cæsalpinia sepiaria (S. Asia).—Failed.

Callitris calcarata (E. Australia).—Doing fairly well; wood scented, durable and cedar-like. *C. quadrivalvis* (N. Africa).—Young trees doing well; wood valuable. *C. rhomboides.*—Failed. *C. robusta* (Murray Cypress, Inland Australia).—Doing splendidly; cedar-like wood; timber durable; the Callitris family will very likely prove about the most valuable tree for this Territory. *C. Whytei* (M'Lange Cedar).—Failed; it requires a moist climate with heavy rainfall; is indigenous to Melsetter district; timber very valuable; strong, cedar-like, scented and is ant-proof.

Callistemon lanceolatus (Scarlet Bottlebrush, Queensland).—A valuable addition to gardens; wood durable and hard. *C. coccinea* (Queensland).—This carries a cream-coloured flower. Is very hardy.

Calodendron capense (Cape Chestnut, S.E. Africa).—Failed here, the rainfall being too little.

Carrisa grandiflora (S. Africa).—Is not doing well; there is a local variety that is very suitable for cattle-proof fences.

Cassia grandiflora (S. Africa).—Is doing splendidly, flowering very profusely, but only grows to a height of about 6 feet; is a valuable acquisition to any garden. *C. fistula* (S. Asia).—Failed. *C. Malaya* (Malay Peninsula).—Is doing rather well, but is somewhat susceptible to frost when young.

Casuarina equisetifolia (E. Africa, S. Asia, sub-tropical Australia).—Has failed after a few years. *C. glauca* (S.E. Australia).—Failed.

C. suberosa var. leptoclada (Beefwood Sheoak of S.E. Australia).—Is doing very well; timber hard but not durable; makes a good shade tree. *C. quadrivalvis* (Sheoak of S.E. Australia).—Is promising well. *C. torulosa* (Beefwood, N.S. Wales and Queensland).—A fairly small tree; is doing well.

Catalpa bignonioides (Catalpa, S. States of N. America).—Failed.

Celtis occidentalis (Hackberry Tree, E. States of N. America).—Is doing fairly well.

Cedrus deodara (Deodar Cedar, N.W. Himalayas and Afghanistan).—Is doing fairly well; is slow growing; a very valuable timber tree.

Cedrela odorata.—Has failed; too cold and dry. *C. toona* (Singapore Cedar, S. India and E. Australia).—Is doing splendidly where frost not severe. Said to be the most valuable timber tree in Australia.

Ceratonia siliqua (Carob-tree, E. Mediterranean).—Doing fairly well; yields the sweet Carob pods; is slow growing here; requires lime.

Cinnamomum camphora (Camphor, Japan and China).—Is very slow growing here. It might do better under partial shade in partly worked out forests.

Cordyline indivisa (New Zealand).—Not a success; the long dry winter is too severe.

Crytomeria japonica (Japanese Cedar, Japan and China).—Failed.

Cytisus laburnum (Laburnum).—Doing fairly well, but has not blossomed at three years.

Cupressus arizonica (Arizona).—This is doing better than any other cypress here; the timber is good; it is growing equally well on poor sand as on the heavier loam; it is a fairly rapid grower. *C. Benthami* (Mexico).—Is doing fairly well; timber valuable. *C. elegans* (Mexico).—A tall, straight tree of elegant habit; a good drought, frost and heat resister; it is about the quickest grower of the *Cupressi* here and the hardiest next to *C. arizonica. C. funebris* (Thibet, Weeping Cypress).—A small tree; more ornamental than useful as a timber tree; doing fairly well. *C. goveniana* (California).—Doing fairly well. *C. glauca* (Cedar of Goa).—Doing fairly well, but is slow growing; cedar-like timber. *C. gudalupensis* (California and Arizona).—This did fairly well for some years, but only a few are surviving; might do well in Mashonaland; makes an excellent hedge. *C. Lawsoniana* (N. California).—A handsome tree; doing fairly well where white ants are not bad. *C. Lindleyi* (Mexican mountains).—Shews indifferent growth here. *C. lusitanica* (Portuguese Cypress, Portugal).—This is almost a complete failure here, the climate being too dry; should do better in Mashonaland. *C. macrocarpa* (Montery Cypress).—A failure. *C. sempervirens var. horizontalis* (Common Cypress, S. Europe and S.E. Asia).—Is growing well, but sometimes suffers from what I take to be sun-scorch on the tips of the topmost branches; it, however, recovers from this; timber first rate and very durable. *C. sempervirens var. pyramidalis.*—Upright variety of above; sometimes known as Churchyard Cypress. *C. thurifera* (Mexican White Cedar).—Failed. *C.*

torulosa (Nepal Cypress, N. India).—This is doing well, but likes a heavy rainfall; first rate timber.

Dalbergia sissoo (Indian Sissoo Tree).—In places is doing well; is somewhat susceptible to frost when young; a first rate timber tree; requires to be fairly closely planted, as it otherwise branches freely; timber valuable; white ants do not apparently attack this tree; a fairly fast grower.

Dodonia viscosa.—Makes a good hedge; have found it rather susceptible to scale here.

Dracœna draco (Dragon Blood Tree of Canary Islands).—Is doing very well here on sand.

Eucalyptus amygdalina (White Peppermint Tree, S.E. Australia).—Is doing fairly well; is hardy against frost; not valuable as timber. *E. bicolor* (Inland E. Australia).—Is doing fairly well; second rate timber. *E. botryoides* (E. Australia).—Doing fairly well; timber hard and durable. *E. calophylla* (Red Gumtree, S.W. Australia).—Has done fairly well; timber used for spokes and rails; not durable underground; carries beautiful bunches of white flowers, much sought after by bees. *E. capitellata* (Stringy Bark of S.E. Australia).—Not done well. *E. citriodora* (Lemon-scented Gum).—Has done well; suffers from severe frost as a young tree; timber good. *E. coriacea* (Leather Gum, E. Australia).—Has done fairly well; is a good frost resister; timber inferior. *E. cornuta* (Yate Tree of S.W. Australia).—As a young tree is susceptible to frost; is doing fairly well where frost is slight; should do better in Mashonaland. *E. corymbosa* (Bloodwood Tree of N.S. Wales and Queensland).—Not doing well. *E. corynocalyx* (Sugar Gumtree, S. Australia and N.W. Victoria).—Is doing fairly well, but should do better in Mashonaland; timber valuable; cattle will browse on the foliage. *E. crebra* (Narrow-leaved Iron Bark, N.S. Wales and Queensland).—Is doing fairly well; timber good; should be given a good trial. *E. diversicolor* (Karri, S.W. Australia).—Failed. *E. etemia*.—Has done fairly well; is a handsome tree. *E. ficifolia* (Crimson Flowering Gum, S.E. Australia).—Is not doing well, but is a good tree at Inyanga; is grown for its gorgeous flowers. *E. globulus* (Blue Gum, Tasmania and S.E. Australia).—Has not done well. *E. Gunnii* (Swamp Gumtree, Victoria and N.S. Wales).—Has done fairly well; is a good frost resister; cattle browse on its foliage. *E. gomphocephala* (Tooart, S.W. Australia).—Has failed; is apparently a coast tree. *E. hemiphloia* (Grey Box, S.E. Australia).—Has done very well; is a good frost and drought resister; timber good. *E. hæmastoma* (White Gumtree of N.S. Wales and S. Queensland).—Failed. *E. lambagei*.—Failed. *E. leucoxylon* (Iron Bark Tree of N.S. Wales).—Is not doing well. *E. longifolia* (Woolly Butt of E. Australia).—Is doing well; timber good. *E. macrorrhyncha* (Stringy Bark Tree of Victoria).—Doing only moderately well. *E. marginata* (Jarrah, S.W. Australia).—Failed. *E. melliodora* (Yellow Box Tree of Victoria).—Doing well. *E. microcorys* (Stringy Bark of N.S. Wales and S. Queensland).—Doing fairly well; a first rate timber tree. *E. microtheca* (Queensland).—Doing very well; very hard timber. *E.*

obliqua (Stringy Bark of Tasmania).—Not doing well. *E. obtusifolia*.—Not doing well. *E. pauciflora* (White Gumtree, N.S. Wales, Victoria and Tasmania).—Failed. *E. pilularis* (Black Butt of S. Queensland and N.S. Wales).—Doing fairly well. *E. piperita* (White Stringy Bark, N.S. Wales and Gippsland).—Fairly well. *E. polyanthemos* (Red Boxwood, S.E. Australia).—Doing well; timber hard and lasting; is used very considerably for mining purposes; for fuel this wood is said to be unsurpassed. *E. punctata* (Leather Jacket, N.S. Wales).—Doing fairly well; timber good; should do better in Mashonaland. *E. pulverulenta*.—Not doing too well. *E. redunca* (White Gumtree of W. Australia).—Doing very well; timber heavy and durable. *E. resinifera* (Red Mahogany Eucalypt of S. Queensland and N.S. Wales).—Doing well; timber very valuable. *E. robusta* (Swamp Mahogany, N.S. Wales and Queensland).—Has failed almost wherever planted here after a few years; not to be recommended. *E. rostrata* (Red Gumtree of S. Australia). Has proved about the best Eucalypt here; is very hardy against frost, heat and drought; the timber is one of the most highly esteemed in all Australia; one of the few Eucalypts that should be grown in this Territory. *E. salmonophloia* (Salmon-barked Gumtree, S. W. Australia).—Not doing well. *E. saligna* (Blue or Flooded Gumtree of N.S. Wales).—A good hardy tree; is doing well. *E. salubris* (Gimlet Wood of W. and Central Australia).—Not doing well. *E. siderophloia* (White Ironbark Tree of N.S. Wales and S. Queensland).—Not doing well. *E. sideroxylon* (E. Australia).—Not doing well. *E. Sieberiana* (Mountain Ash in N.S. Wales and Ironbark Tree in Tasmania).—Another of the Eucalypts that has done well here; it has been tried on heavy and light soils, and in no case has it failed; wood is of excellent quality, strong and elastic; very durable in mines; makes an excellent firewood. *E. Stuartiana* (Apple-scented Gumtree, S.E. Australia).—Not doing well. *E. tereticornis* (Red Gumtree of E. Queensland).—This is another of the Eucalypts that is doing very well here, and is to be recommended for extensive planting in this Territory; timber good. *E. viminalis* (Manna Gumtree, S.E. Australia).—Not doing well.

Erythrina indica (India).—Failed; too cold. *E. humeana*.—This is a "Kaffir-boom" of Mashonaland, but it is too cold for it here. *E. zeyheri*.—This is the local one here, and is planted as a live fence; poles 6 feet long and 4 inches in diameter being planted *in situ*, where they at once take root.

Eugenia jambos (India).—Failed. *E. latifolia* (India).—Failed.

Ficus australis (Australia).—Too cold. *F. indica* (India, Banyan Tree).—Too cold. *F. macrophylla* (Moreton Bay Figtree, E. Australia).—Too cold. *F. Watkinsiana* (Australia).—Too cold. Most of the above Ficus are alive here, but they are cut down every winter; I think the majority of them should do fairly well in Mashonaland.

Flindersia australis (Crown Ash, N.S. Wales and Queensland).—This also is cut down during the winter months.

Fourcroya gigantea (C. America).—This can be used for scenic purposes, but for climatic reasons it is not a commercial plant here.

Fraxinus americana (White Ash, E.N. America).—Doing fairly well; it did not do well on the sand; resists extreme heat well. *F. excelsior* (European Ash).—Not doing well; the long dry spring is very trying to this tree. *F. oregana* (California and Oregon Ash).—Failed. *F. viridis* (Green Ash of E.N. America).—Is doing fairly well, but here is only a young tree; wood excellent.

Ginkyo biloba (China and Japan).—Very slow growing here.

Gleditschia triacanthos (Honey-locust Tree of S.E. States of N. America).—Not a success.

Grevillea robusta (Silver Oak, E. Australia).—Does fairly well; is a good drought resister; timber valuable.

Hakea suaveolens (E. Australia).—Failed.

Helectris isora.—Failed.

Harpullia pendula (Tulip Wood of Queensland).—Failed.

Hymenæa courbaril (Tropical America).—Doing fairly well.

Jacaranda mimosæfolia (Brazil).—This tree is tender to frost when young, but does not appear to be affected after about the second year; its gorgeous blue flowers and feathery foliage make it a great favourite in most gardens; timber valuable.

Juglans cinerea (Butternut Tree of E.N. America).—Doing fairly well. *J. nigra* (Black Walnut Tree, E.N. America).—Is doing fairly well and has borne fruit here; must have lime in the soil.

Juniperus bermudiana (Pencil-Cedar of Bermuda).—Doing fairly well; wood extremely valuable. *J. mexicana* (Mexico).—Doing fairly well. *J. r onosperma* (Mexico).—Failed. *J. occidentalis* (N. California and Oregon).—Failed. *J. pachyphloia* (Texas and Mexico).—Doing fairly well; should do better in Mashonaland; feels the long dry spring here. *J. scopulorum*.—Failed. *J. virginiana* (N. American Pencil-Cedar).—Doing fairly well; should do better in Mashonaland.

Lagerstromia flos-Regina (Pride of India).—Is only a shrub here; it is grown here for its gorgeous flowers; but in India it is a valuable timber tree.

Lagunaria Patersonii (N. Queensland).—This tree is rather tender to frost when young. It is evergreen and a good drought and heat resister; carries large purple flowers.

Leptospermum lævigatum ("Sandstay," Tropical Australia).—Failed.

Ligustrum japonicum (Japanese Privet).—Is doing quite well; makes a good hedge.

Lycium horridum (Kaffir Thorn, Africa and S.W. Asia).—Makes a capital cattle-proof fence; almost evergreen; quick in growth; stands clipping well.

Mangifera indica (Mango, S. Asia).—It is too cold here to grow profitably, but the trees here have borne fruit.

Manihot Glaziovii (Ceara Rubber, Brazil).—It is too cold here for this to be of any value as a commercial tree.

Maclura aurantiaca (Osage Orange, Texas).—Fair here.

Melaleuca leucadendron (Cajaput-tree of India).—Failed; too dry; may do in vlei lands in Mashonaland.

Melia azedarach (Syringa, S. Asia, N. and E. Australia).—Is very hardy; timber soft and of a red colour; is rather apt to get scale here.

Morus alba (White Mulberry Tree, Upper India and W. China).—Makes a good hedge; doing well here. *M. nigra* (Black Mulberry Tree, Persia).—Doing well; bears fruit of excellent quality here. *M. rubra* (Red Mulberry Tree, E.N. America).—Doing fairly well. *M. indica* (India).—Doing fairly well.

Michelia champaca (Himalayas).—Failed.

Olea europea (Olive Tree, S.W. Asia).—Is doing fairly well; is slow growing.

Parkinsonia aculeata (Jerusalem Thorn, California).—Thorn hedge plant; handsome flowers; doing well.

Paulownia imperialis (Ornamental Tree).—It is too cold here for it, but it has blossomed; may do well in Mashonaland; is a handsome tree.

Phœnix reclinata (S. Africa).—A hardy species of Palm; does well here; grown for ornamental purposes. *P. dactylifera* (Date Palm, N. Africa).—Failed.

Phytolacca dioica (Belhambra, Argentine).—Does very well here, but apart from being a good shade tree it is useless; must not be planted near buildings on account of its large surface roots.

Pittosporum undulatum (S.E. Australia).—Shrub only here.

Poinciana regia (Flamboyant).—This is doing fairly well where it is not too cold; it bears masses of gorgeous scarlet flowers; is a good shade tree.

Pinus Canariensis (Canary Pine).—So far is doing fairly well; timber good. *P. cembroides.*—Failed. *P. densiflora.*—Is quite a young tree here; it likes rich soil; timber good. *P. flexilis* (White Pine of Rocky Mountains).—Not doing well. *P. halepensis* (Jerusalem Pine).—Is a winter rainfall pine; slow growing here. *P. insignis* (California).—Is doing well here at present, but may fail later on; not to be recommended for growing as a commercial tree. *P. longifolia* (Cheer Pine, Himalaya Mountains).—This is doing well here, and so far promises to be the best pine tried; it is a fine timber tree, and should be given an extensive trial. *P. pinaster* (Cluster-Pine, Mediterranean).—This is doing very well here, but the timber is not of good quality. *P. ponderosa* (Yellow Pitch-Pine).—Doing fairly well; timber first rate; N. America. *P. pinea* (Stone Pine, Mediterranean Sea and Canary Islands).—This is the tree that one sees so extensively planted at the Cape; is very slow growing here. *P. monophylla* (Stone or Nut Pine, California and S.W. States of America).—Doing fairly well. *P. sabineana* (California to Rocky Mountains).—Is doing fairly well, but is very slow growing here. *P. sylvestris* (Scotch Pine, plains of W.

Europe and mountains of S. Europe).—Failed. *P. strobus* (Weymouth Pine, N. America).—Not doing well.

Ptæroxylon utile (Sneezewood, S. Africa).—This is doing fairly well; it is slow growing; an indigenous variety that grows in the Matopos is a very stunted and crooked tree; wood very valuable for posts and is considered almost imperishable; it is grown under partial shade here.

Quercus cerris (Turkey Oak, S.E. Europe and S.W. Asia).—Failed. *Q. pedunculata* (Common Oak, Europe).—This is very slow growing here, and it is doubtful if it will ever be a useful tree here, but at Inyanga it has done very well and furnishes an abundant crop of acorns, which are utilised for pig feed. *Q. suber* (Cork Oak, S. Europe and N. America).—Failed.

Robinia pseud-acacia (N. American Locust Acacia).—Practically failed.

Sapium sebiferum.—Is very stunted here.

Schinus molle (Pepper Tree, Andes of S. America).—A good ornamental tree; does not like granite soils.

Sterculia platanifolia.—Is not doing well here; it is attacked by a borer in the young shoots.

Sequoia sempervirens (Redwood of N. America).—Has failed after a few years.

Syringa vulgaris (Lilac, Asia Minor and Persia).—This is very slow growing here, but it has borne blossoms; it is rather susceptible to scale.

Syncarpia laurifolia (Turpentine Tree, Queensland and N.S. Wales).—Has failed.

Tamarix Gallica (Tamarisk).—This is doing quite well; it is a useful tree for dry, brackish ground; S. Europe, N. and Tropical Africa, S. and E. Asia.

Tristanea conferta (Brush Box, N.S. Wales and Queensland).—Not doing well.

Taxodium distichum (Bald Cypress, N. America).—Is not a success; so far slow growing and am afraid will be a failure;; timber valuable.

Tamarindus indicus (Tropical Asia and Africa).—Appears to be too delicate for Matabeleland, but may do in Mashonaland; it is a very valuable timber tree and makes a fine avenue.

Thuya occidentalis (Arbor Vitæ, N. America).—Is doing very well so far, but it is doubtful if it will become a timber tree here; it makes a fine ornamental hedge, attaining any required height, and is very compact.

Yucca angustifolia (Arizona).—Is doing well; these and the following varieties are included as useful for scenic purposes. *Y. baccata* (Colorado).—Is doing fairly well; this furnishes good fibre; makes a good hedge. *Y. filamentosa* (Florida, the Adam's Needle).—A good fibre plant.

Agricultural Union Congress.

BULAWAYO, 1918.

The Fifteenth Annual Congress of the Rhodesia Agricultural Union was held at Bulawayo on 6th to 9th March inclusive. A large number of important subjects was dealt with, and the discussions as a whole were marked by a spirit of reasonableness which made it possible for a good deal of useful work to be done. Some of the debates attained a high level, and were remarkable for the broad-minded outlook of the speakers, who readily subordinated personal and immediate interests to those of the future and the community generally.

The Congress was officially opened by the Treasurer, Mr. F. J. Newton, on behalf of the Administrator, who was unavoidably absent. In his speech he reviewed the present agricultural position in respect of its two chief branches, viz., cattle and grain, and made some remarks indicative of the Government attitude towards the burning question of cattle dipping and the suppression of African Coast Fever. Owing to the record grain crops in America and elsewhere, it was possible the Imperial Government might decide not to purchase supplies from South Africa. In this case, he pointed out, we should need to find other markets for any exportable surplus of maize there might be in Rhodesia this season; possibly such markets might be found in East Africa or Mesopotamia. Turning to the pastoral side, he emphasised the fact, not generally recognised, that it was Rhodesia which had initiated the campaign for protecting this sub-continent against a possible inroad of rinderpest from (German) East Africa, and spoke of the excellent work done in this connection by Mr. Hooper Sharpe. The improved position of cattle breeders in the matter of markets was shewn in several directions. Over 13,000 head of slaughter stock had been exported to the south, and this business, together with the export of maize, had brought £300,000 of cash into the country. Mashonaland was now admitted to the same facilities as Matabeleland for the export of slaughter cattle to the Union, while the Imperial purchase of cattle for East Africa had provided still another outlet for slaughter cattle.

The Treasurer's statement in reference to the draft Dipping Ordinance was elucidatory, and proved of great assistance in the subsequent debate on this subject. The Government welcomed practical suggestions. If necessary, they were prepared to increase the number of cattle inspectors, and he suggested these officers might be graded, but he did not favour the idea that cattle inspectors should all be veterinary experts, for, desirable though that might be, it was impossible, and a little knowledge was dangerous. He saw no reason why both the

standard strength of dip solutions and the intervals of dipping should not be fixed by the Ordinance itself rather than by regulations.

In conclusion, he referred to the good work being done by the Munitions and Resources Committee, and the prospect of new industries being started in Rhodesia as the result of this work.

Mr. E. A. Hull, in his presidential address, appealed to all the farmers of the country to support the Union. Already 46 associations, covering 1,200 farmers, were members, but there were still many others whose duty it was to organise themselves and add their strength to the Union. As president of the Union, Mr. Hull paid a graceful tribute to His Honour the Administrator for his personal efforts, which had resulted in facilities being granted for Mashonaland to export cattle to the Union. He also spoke with eloquence and force upon the great necessity of co-operation among farmers, and the importance of loyalty to the principle.

It may be said, without exaggeration, that the main business with which Congress concerned itself was a consideration of the African Coast Fever question. The main discussion took place on a draft Ordinance to apply compulsory dipping throughout Southern Rhodesia, not as at present only in such localities as, by their own election, choose to have this system enforced. It was clear from the outset that an overwhelming majority was in favour of this extension of the principle, and Congress turned to consideration of the draft in detail. Here, not unexpectedly, differences of opinion arose, yet for the most part decisions were reached unanimously, or at least *nem. con.*

To secure the object in view, eradication of the tick and thereby protection against tick-borne diseases of cattle, it was realised that regular periodic dipping in effective tick-destroying solution was essential, and this was all that was necessary.

It was clearly brought out that the general desire was to make the following punishable offences—

(1) for cattle to be tick-infested;
(2) to fail to dip regularly;
(3) to dip in a solution of inadequate strength.

When it came to the interpretation of these terms, there was less unanimity, but ultimately agreement was reached.

After thorough debate the ten-tick standard of infestation was adopted.

It was agreed that, to ensure regular dipping, a maximum interval must be fixed, though at the same time some discretion and elasticity are desirable; the ultimate idea being that no undue hardship would arise if normally dipping be secured twice within fourteen days. This led to consideration of exemption for cattle in severe weather, or for other exceptional causes, to be applicable to one farm, or a group of farmers, or a much wider area, such as a district, if necessary. Then the notification publicly of such exemption was agreed upon as desirable.

The strength of tick-destroying agents provoked much discussion, and here the view of the scientist as to the irreducible minimum must be accepted on a simple point of fact, *i.e.*, the amount of poison necessary to kill ticks with certainty when applied at a stated interval.

The feeling of Congress was strongly in favour of maintaining the present facilities for loans for dipping tanks, and these it was agreed to incorporate in the new law.

The views of the Agricultural Union, though not perhaps always expressed in parliamentary form, are yet sufficiently clear to indicate the lines on which amendment of the draft is sought. It will not be possible in the last resource to satisfy all conflicting opinions or to meet every contending interest, but it should not be beyond the wit of man to devise a system workable without undue hardship, particularly if, when the law comes to be enforced, the same praiseworthy spirit of public support is found which was so clearly manifested in the deliberations of the Congress. As a result of the modifications suggested a fresh draft of the Ordinance will be necessary, and a final opportunity for discussing and dealing with it will arise in the approaching session of the Legislative Council.

After the proposed Ordinance had been debated, a discussion took place on the majority and minority reports of the recent Committee of Enquiry, in which Mr. Gilchrist gave an account of his stewardship as the representative nominated on behalf of the Union.

An important item on the agenda paper was the subject of settlement of soldiers on the land. Mr. R. C. Simmons, Controller of War Settlement, made a statement as to the progress made by his department in the selection of suitable land, and said that the work of inspection would be continued as soon as weather permitted. On general policy, he pointed out that the offer of the Directors of the British South Africa Company of 500,000 acres of free land was distinctly an immigration scheme for the purpose of bringing new settlers into the country. Any proposal for rewarding Rhodesians who were serving at the front must be on a separate basis.

The delegates, after discussion, expressed their determination that Rhodesians should be treated with a generosity at least equal to that meted out to strangers by passing a resolution to the effect that the Government must be informed that it is the settled opinion and wish of the farmers that in any scheme for granting free land to ex-soldiers, preference must be given to Rhodesians who have served the Empire.

The question of establishing an experiment farm, or farms, on the granite soils was very fully debated. It was felt that the stations near Salisbury, although doing good work, did not wholly meet the needs of the situation. As by far the greater part of the country consisted of sand veld, it was urgently necessary that experiments should be carried out on this class of soil with a view to the discovery of suitable crops, so that farming on sand veld might, if possible, be made a profitable business. It was suggested that, as the Gwebi station is self-supporting, the vote at present on the Estimates for the upkeep

of that station should be appropriated for the establishment of a new station on sand veld. Finally it was decided that the Union should approach the elected members of the Legislative Council and request them to urge upon the Government the need of experiment farms on granite and other soils at accessible points.

A most instructive and significant discussion took place over the proposal that the Government should investigate the possibility of teaching handicrafts, which could be carried out at their kraals, to the native population, in order to make them better citizens and of more economic value to the country. When we remember that it is not so very long ago since leading farmers declared they could not grow grain in competition with the natives, and actually asked that native production should be restricted, it indicates a most remarkable advance that at a meeting of farmers not a single voice was raised against the principle of the proposal. A fear was expressed that if the proposal were adopted, competition with white artisans and others might be artificially stimulated and the supply of labour to farms and mines decreased, but the feeling generally was that the white man must rely on his inherent superiority to meet competition. The idea underlying the resolution was put by one speaker in a nutshell when he said anyone responsible for native policy in Rhodesia might ask himself two questions. Seeing the mass of natives largely idle and of a minimum value to the community, how could they be made more useful and at the same time induced to go out and work? He would not begin by making them leave their homes to labour at uncongenial work for aliens, but he would seek some way to induce the love of work for the reward it brought. The more money a man had the more he wanted, and if the natives were shewn that by the performance of home crafts, such as weaving, basket making, etc., they could earn money, then they would learn to spend money and to want more. All natives were not equally skilled in handicrafts, but the love of spending money was contagious, and those who could not make money at home would go out to mines and farms. Therefore, the adoption of the proposal would in the long run tend to increase the supply of labour for Europeans generally. The proposal was unanimously carried.

There was an interesting discussion on the subject of educational facilities for the rural population. A statement made by the Director of Education was well received and somewhat cleared the air. There was a feeling of satisfaction at recent progress in educational matters, but the Congress again declared in favour of free and compulsory education for all white children.

Baboons were also made the subject of discussion. Appreciation was expressed of the help rendered by the Native Commissioners in organising drives, but it was felt something more was needed. It was thought Government might help in the matter of rifle cartridges, which are now very expensive.

In a similar way it was suggested that the Native Department might be asked to extend definite help in the matter of controlling veld fires by turning out natives and burning fire guards, etc.

Among other subjects of varying importance handled by the Congress were the questions of native labour and the relations of the farmers and the Labour Bureau. From information supplied by the Native Department, it appeared that 36,000 indigenous natives were employed in Southern Rhodesia, the remainder of the labour being supplied by aliens. Mr. Upton, Manager of the Labour Bureau, attended, and was able to answer many questions relating to the work of his organisation. After considerable talk, a resolution was passed which would have the effect of altering the constitution of the R.N.L. Bureau in favour of the farmers, but whether the change is possible under the memorandum of association was not known. It was proposed that the granting of the annual subsidy (£12,000) by the Government to the R.N.L. Bureau should in future be made contingent upon representation on its board being arranged on the basis of the number of natives employed, instead of on the amount of capital subscribed. This would give the farmers additional representation.

Many other matters of interest were dealt with, such as the Bacon Factory, the Gwelo Creamery, medical charges in the country districts, roads, the jury system, quarter-evil, liver fluke, etc., etc., but sufficient has been said to indicate the chief business of the Congress, and to shew that the meeting was of exceptional value, especially in the direction of extending the principle of co-operation between the Government and the farmers.

Photo by Mr. R. W. Jack.

Mexican Marigold (*Tagetes minuta*, Linn.).

Photo by Mr. R. W. Jack.

Khaki Weed (*Alternanthera echinata*, Smith).

The Mexican Marigold.

A TROUBLESOME WEED.

By F. Eyles, F.L.S.

This Territory has in recent years been invaded by a foreign weed which belongs to the category of "troublesome" rather than "noxious" weeds. A noxious weed is generally considered to be one that does direct damage by poisoning stock or by injuring man or beast, or the products of the latter, as is done by the Bur-weed, which destroys the value of wool.

The weed under notice is known here as the "Mexican Poppy," in Australia as the "Stinking Roger," and its botanical name is *Tagetes minuta*, Linn. (family *Compositæ*). It is an erect, branching herb, often attaining 6 feet in height, characterised by a somewhat yellow tinge pervading the stems, branches and to some extent the leaves. The flowers are yellow to cream-coloured, but the most striking character is the powerful odour, reminiscent of marigolds, which is given off by all parts of the plant. The general appearance of this weed can be seen in Plate I., which shews (1) a flowering head, (2) a leaf, and (3) the root. It will be noticed that the leaf is divided into a number (varying) of narrow, toothed leaflets. At the base of these teeth, and on each side of the midrib, are numbers of small orange-coloured glands which contain the oil that is responsible for the peculiar smell of the plant.

The Mexican Marigold is a native of South America, and is supposed to have been introduced into South Africa during the Boer war. It has been observed in Rhodesia for several years past, where it is now a too familiar feature of the flora of town commonages, waste places and, unfortunately, also of cultivated lands, where it shews a marked predilection for ant-heaps, and it is no uncommon sight to see every ant-heap over the whole extent of a large piece of fallow land completely covered with the marigold, which not only holds its own in competition with the native vegetation, but appears able to dominate and crowd out many of our local grasses and weeds. It is spreading rapidly through the country, but there seems no special reason why it should be dreaded by the farmer any more than the common, native weeds. Its root system is shallow, not very extensive, and the plant should be easy to destroy or keep in control. It succumbs to the usual methods of cultivation, but if its spread is to be checked, it is important that

it should be uprooted and killed while young, that is before flowering, so that seed may not be formed.

I recently found that some farmers were speaking of the Mexican Marigold under the name of "Khaki Weed," which is an entirely different plant that was known here long before the marigold made its appearance. This confusion has doubtless arisen from the fact that the Dutch in the Union call the marigold the "Khakibos." In order that this point may be made clear, I give also a photograph of the true Khaki Weed (Plate II.). This belongs to the same family as the "Pig Weed" (*Amarantaceæ*), and its botanical name is *Alternanthera echinata*. The Khaki Weed, instead of being erect, is a prostrate herb running along flat on the ground, with small, pale-brown flower heads or spikes. These spikes contain a number of sharp, horny prickles which penetrate the skin or break off when the plant is handled, and no one is likely to mistake this weed for the Mexican Marigold if he has once tried pulling it out of his garden path by hand.

Bacon Factory.

CIRCULAR No. 5.

The following circular was issued on 5th of March by the Acting Commercial Representative of the British South Africa Company, and copies were forwarded to the farmers' associations throughout the country for distribution to their members:—

On and from 1st April next the Bacon Factory will pay the following prices for bacon pigs:—

Prime bacon pigs weighing 160 to 210 lbs. live weight, 5½d. per lb. live weight.

Second-grade pigs, 4½d. per lb. live weight.

Third-grade pigs, 3d. to 3½d. per lb. live weight.

The management is not prepared to buy boars or stags, as they are of no use to the factory.

Cultivation of Orange Orchards.

By A. G. Turner, Citrus Adviser.

A popular fallacy which causes many mistakes in selecting orchard sites is the belief that the best fruit lands are to be found on high, stony ridges where the soil is thin and poor, the theory being that there is something in gravelly soil which produces fruit of the finest colour and flavour. It is supposed that rough, hilly ground gives freer circulation of air and freedom from frost, while poor soil checks rank sappy growth and causes trees to bear better. There are a few grains of truth in all this error. As a rule, hills are less liable to frost than valleys, and low-lying land is sometimes insufficiently drained for orange trees. But most of the large plantings in South Africa and America are in valleys on fairly level land. Orange trees are like other crops in thriving best on good, and even rich, well-drained soil. It is of primary importance that any site chosen for an orchard should have the deepest possible soil, so that thorough good cultivation can take place. The deeper the soil the greater its power of retaining moisture and the larger amount of plant food it contains. Avoid all ground that has iron-stone conglomerate ("oud klip") on the surface or within several feet of it, which is quite a frequent outcrop in this country.

To the novice the various horticultural operations seem simple enough, but fruit growers often fail to observe even the fundamental principles of their own business. It is an established fact that spraying and cultivation are essential to successful fruit growing, yet these important operations are often neglected; more damage is done sometimes by spraying a little and cultivating a little at the wrong time and in the wrong way than by leaving these things alone altogether.

Intensive methods are often profitable in other kinds of farming, but in orange or any fruit growing they are absolutely necessary to success, which is a fact that many do not realise. It is a popular, though mistaken, idea that the less work with which an orchard can be operated the more profitable it will be, whereas the opposite is the rule, more profit accruing every time from an orchard that is thoroughly attended to in every detail than from one that suffers from neglect of any kind. Growers who put the most work on their fruit usually make the most money, while those who give their orchards the least care and attention make the least money, or none at all. Common excuses of fruit growers, who have not made their orchards profitable, are that it will not pay, or that they cannot afford to put much work into their

orchards, yet those who make the big money in fruit are generally those who go to the most trouble and expense over every operation that has to do with this part of their business. It is hard for the average person to see how it pays to take the care and pains which up-to-date orchardists find are necessary for the well-being of their orchards, so that they shall be remunerative, although the same rule applies to any profession or trade that is undertaken.

When the site has been selected for the orchard, presuming, of course, that all stumps and surface rocks have been cleared off, and grading of the land for irrigation purposes has been completed, the first operation is to prepare the land very thoroughly by ploughing and sub-soiling. If sub-soiling is not possible, on account of shortage of animals, ploughing *must* be done, and the deeper the better. After the land has been levelled as much as possible by harrowing, the planting of the trees can be proceeded with.

One of the most important needs is the stirring of the soil around the young trees, and this should be accomplished by digging or hoeing around each tree every fortnight, if weather conditions permit. As orange trees are usually planted in this country during the summer or wet season, it is not advisable to work around them with the soil in soggy condition, but as soon as a fine spell occurs, the ground should be loosened, and the earth near the trees should never be allowed to pack or become hard.

Speaking generally, it is not advisable to work animals in the orchard after the heavy rains of summer have set in. The most suitable practice to follow in this country is to allow the first crop of weeds to come up with the early rains, then plough them in and sow a cover crop, or keep the cultivators going so as to check the weeds until the machines can no longer do useful work, then sow the cover crop. In either case the cover crop should be allowed to grow until towards the end of the wet season, when it must be ploughed in, which is often the only time of year that it should be necessary to use ploughs for cultivation in orchard work.

It may not be out of place to remark here that the use of oxen should be avoided, if at all possible, and especially long spans drawing heavy, clumsy ploughs, which are almost certain to cause damage to the trees. All implements should be comparatively light and easy to handle. In orchard ploughing, the wisest course to follow is to use a single-furrow mould board plough for cutting out, say, two or three furrows against each row of trees, when the centre strip can be worked out with a two-furrow mould board plough drawn by six mules or even eight oxen, provided they are not allowed to work near the trees. Harrowing should follow behind the plough as soon as possible. Cross ploughing and harrowing should take place as soon as the cover crop has sufficiently rotted to allow the ploughs to do satisfactory work without packing.

The subsequent cultivation throughout the dry season consists of a frequent stirring of the soil at intervals of about three weeks, in order to produce a loose condition of the surface, which acts as a mulch, and

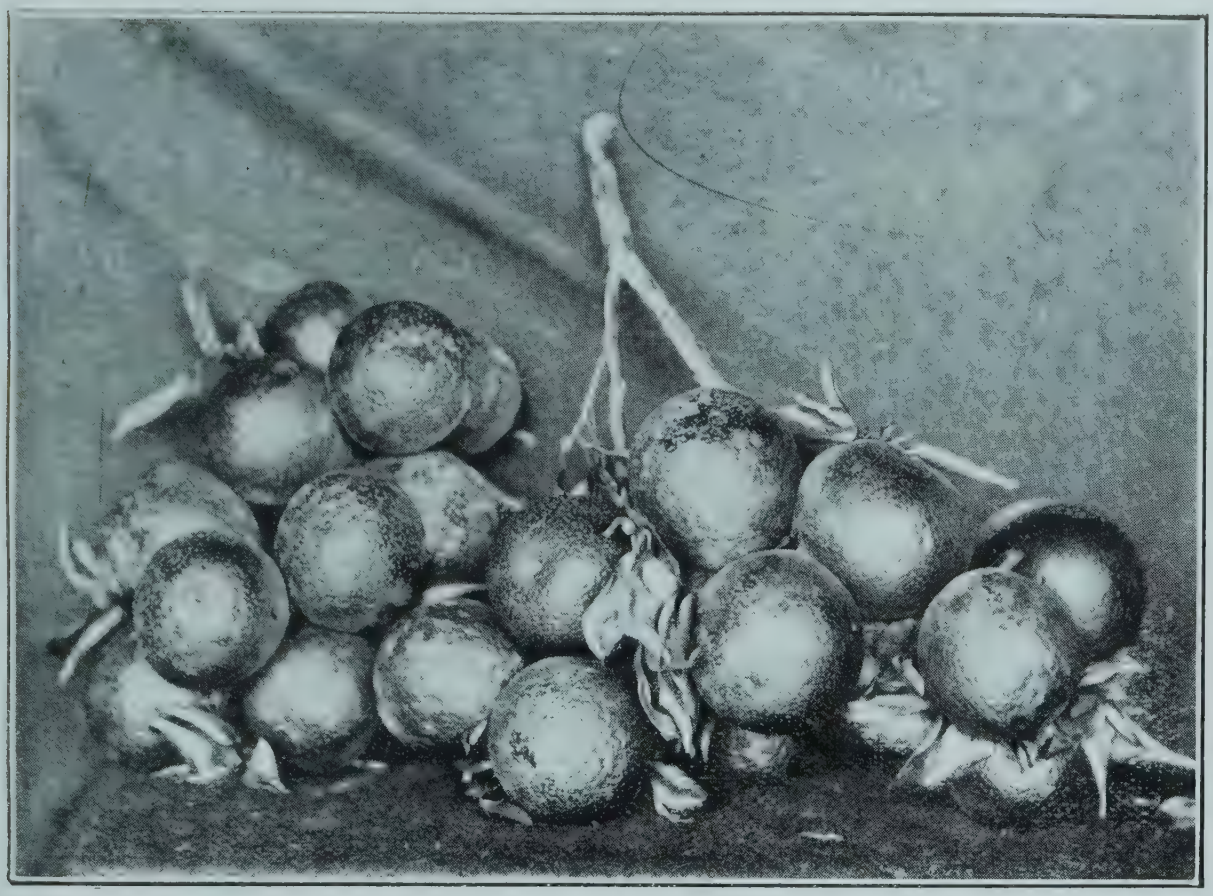


Photo by Mr. A. Howat.

Two Bunches Oranges, from Premier Estate, Umtali.

Young Orange Tree, Mr. W. E. Thurlow's Farm Atherstone, Mazoe.

prevents evaporation of the moisture in the land. This cultivation should be continued until such time as the first irrigation takes place, and, after each application of water, the land must be cultivated as soon as it is in condition for the animals to work properly. It is perhaps advisable to point out that cultivation, as spoken of here, does not mean constant ploughing and harrowing, which work would be unnecessary and expensive. The implement to use is the "cultivator" fitted with teeth of varying widths from $1\frac{1}{2}$ inches to 4 inches, handy orchard makes of which, set on low wheels to obviate damage to branches, usually cut about 5 to 6 feet, and stir the soil to a depth of 3 to 6 inches. Two large mules, or four of the usual type worked in this country, can easily pull this machine; such a cultivator can be fitted with sweeps, which are often useful in the early summer, also with discs. With a cultivator of this sort five to eight acres can easily be worked per day, dependent a good deal on the class and condition of land. Disc harrows, which are made reversible, are also very useful implements for orchard work.

Many people consider that such continual work is labour in vain, although it is a well-established fact that constant stirring of the soil continually alters the surface, thus forming a fine earth mulch and checking evaporation and also destroying weeds. Further than this, cultivation brings about the best conditions for the successful growth of the trees and fruit, by pulverising the soil, and so admitting the penetration of air to the roots and assisting in the general healthy upkeep of the soil.

As has been stated above, cultivation should be continued so long as useful work can be done without detriment to the land, when the cover crop should be planted. It is advocated by some people that a free growth of weeds should be allowed to grow in order to check erosion of the soil and be ploughed in at the end of the rains. This procedure is all right in so far as checking erosion, but the weeds rob the trees of a very large amount of nourishment. They certainly give some return in humus when turned in, but little else. An orange orchard overgrown with weeds generally spells neglect, and is the surest way of producing fruit liable to many kinds of fungus troubles that not only render the fruit unmerchantable, but do great injury to the trees. By planting a leguminous cover crop, the same benefits may be obtained. Some weeds are bound to grow, thus just as good a check on erosion is formed, while the legume has the property of accumulating nitrogen, which is the most expensive of all fertilising agents, so that when ploughed in a very valuable food is given in addition to the humus. Soils that bake very readily after irrigation or rains, or very sandy soils, can be materially improved by the use of cover crops.

Cover crops protect the soil from both sun baking and surface washing; they keep down the bulk of weeds, and when ploughed in as a green manure improve the fertility and general condition of the soil and increase its capacity for retaining moisture. The best results are obtained if the cover crop is sown after the first good rain and ploughed under at the end of the wet season. It is good practice to follow rotation methods with cover crops, choosing plants that make good cover

and provide abundance of material for green manure. They may be leguminous or otherwise, depending largely on the requirements of the trees. Among crops that serve these useful purposes, barley, rye or buckwheat are suggested as non-leguminous crops; while cowpea, velvet bean and sunn hemp are all good legumes to grow. The last-named, which thrives well in this country, is largely grown in India for green manuring, and though it has never yet been used in citrus orchards in Rhodesia, it has been successfully employed for this purpose in the Transvaal.

Nature Notes.

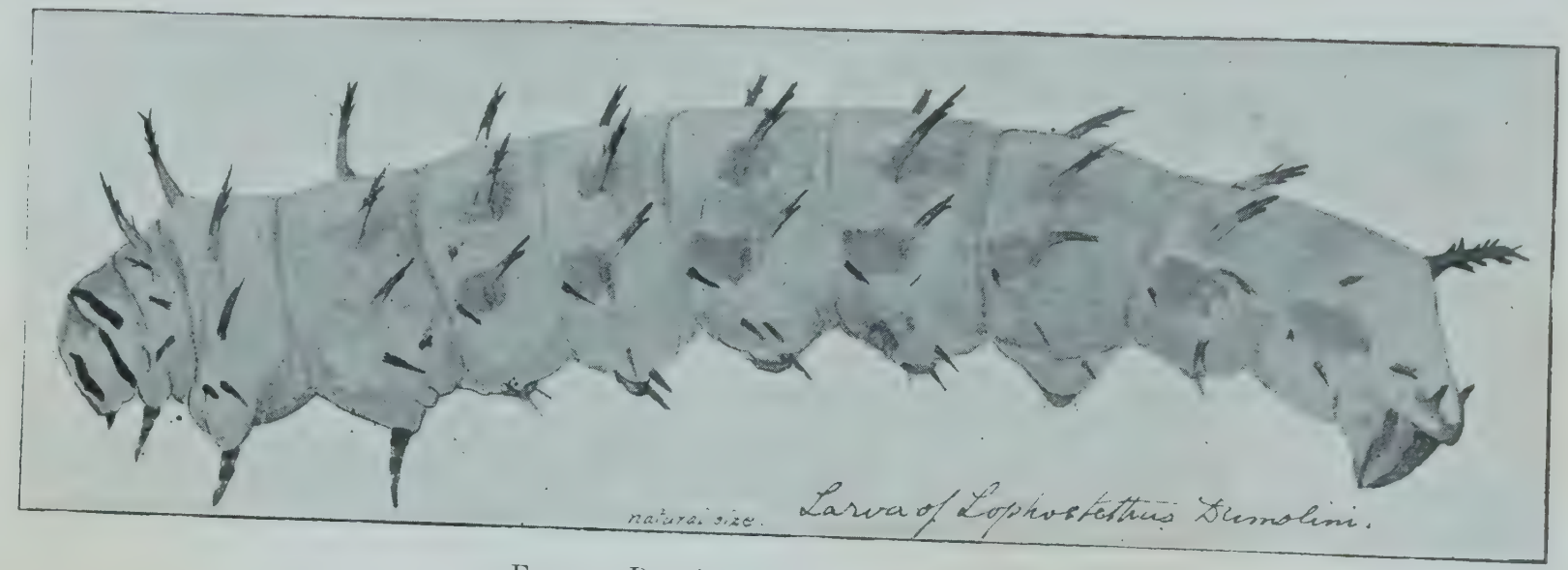
IX. THE HAWK MOTHS OF MASHONALAND.

By Rev. Father O'Neil, S.J.

The Sphingidæ or Hawk Moths of Southern Rhodesia are, if not so large, at any rate as interesting as the Emperor Moths about which I wrote something in this *Journal* early last year. In the present paper I propose to give a short account of the different Hawk Moths that have been found in Mashonaland, particularly in the neighbourhood of Salisbury. This locality appears to have a greater variety of large moths than any other in South Africa, for no fewer than 28 species of Emperor Moths have been found here, while the number of different Hawk Moths taken in or close to Salisbury is 27, only two short of the total number recorded from the entire Transvaal.

Sphingidæ are to be recognised by their robust bodies, which in a good many species almost taper to a point, thin long narrow fore-wings, usually pointed at the apex, small hind-wings, and thick antennæ, which are often hooked at the tip.

Most of these moths are crepuscular, and they are generally to be seen hovering over flowers between sunset and nightfall, their wings vibrating so rapidly as to be almost invisible, and they dart about from flower to flower with marvellous swiftness. A few of the smaller kinds —the Humming-bird and Bee Hawk Moths—are diurnal, and these may



From a Drawing by Dr. Arnold. Bulawayo.

be seen on a sunny day extracting the nectar from flowers with their long proboscis.

A few moths belonging to other families resemble the Sphingidæ in the shape of their wings and body; but their flight and habits are different from those of the Hawk Moth, and their antennæ are filamentary or thread-like, not thick and robust. There are, besides, structural points of difference into which it is not necessary to enter.

The caterpillars of all South African Hawk Moths are very easy of recognition, as they all have a conspicuous horn-like process on the middle of the last segment. This "horn" is as a rule very long and slender in the early instars of the caterpillar and becomes thicker and shorter as the creature grows in size. In one of our Sphingidæ, as will be mentioned later, it almost disappears as the caterpillar attains its full development. These caterpillars are more easily reared than those of the Emperor Moths, for most of them feed voraciously and grow very rapidly. When full-fed the majority burrow into the ground to undergo their transformation into a chrysalis; a few kinds retire into a secluded spot and spin a light web within which they pupate.

The largest and finest of our Sphingidæ is a superb insect to which the popular name of the Arrow Hawk Moth has been given, its scientific designation being *Lophostethus dumolini*. This moth is found in the eastern part of the Cape Province (the Peddie Bush), Natal, the Transvaal and Southern Rhodesia, and natives from Nyasaland have told me that the caterpillar is often seen in their country. In Natal the moth is sometimes captured or reared near Durban, but it appears to be very scarce in the Cape Province and the Transvaal. It is by no means uncommon in parts of Rhodesia, and during the last two summers a considerable number of specimens have been reared in Bulawayo and Salisbury. In Matabeleland and in countries south of Rhodesia the wings of this fine moth are generally yellowish-brown, and in the central and upper area of the fore-wing there is a large sub-triangular patch of much darker hue. About the middle of this patch are two creamy white marks, the one nearer the body being small and round and the outer one much larger and closely resembling an arrow-head in shape. Hence the name of the moth.

I have reared several specimens of this magnificent Sphingid from caterpillars found on trees close to Salisbury, and all of them are larger and very much darker than examples captured or reared in other parts of South Africa, the fore-wings being dark greyish or olive brown with narrow wavy lines of a lighter tint and the upper central patch very dark indeed; the hind-wings too are much darker than those of the more southern variety. Two of my bred specimens measure $6\frac{3}{4}$ inches across the expanded wings, and the others are only a trifle less. The moth attains an even larger size than this, a friend of mine having reared at Salisbury a gigantic specimen with a wing expanse of $7\frac{1}{4}$ inches. Those I have seen from Natal expanded only from $5\frac{1}{2}$ to 6 inches.

The caterpillar too when full grown is of enormous size, from 6 to 7 inches long and thicker than a man's thumb. After its final moult

it is sage green, turning to greyish white, its colour putting one in mind of a soiled white kid glove as it reaches its full size. On each side of the head are two narrow black streaks, and on the vortex, or upper part of the head, there is a transverse, slightly raised black band. Each segment of the body is armed with six or eight black spines, the upper half of which is jet black (a few of the spines being entirely black), and the four rows of dorsal spines are very long, strongly barbed and bifid at the tip. The horn at the end of the body is also long, shining black and barbed like the spines. The thoracic or true legs are black, and the abdominal feet are black on the outer and brick red on the inner half, and each of them has a short black spine.

This huge caterpillar with its armament of black spines looks a truly formidable creature, and perhaps many birds would be afraid to attack it; but it is sometimes parasitised by a very large black and red ichneumon wasp. Its ordinary food-plant in Rhodesia is *Dombeya rotundifolia*, known to the Mashonas as *Mutowe*, a tree with dull greyish-green round leaves, the light grey colour of whose underside harmonises so well with that of the caterpillar as to render it inconspicuous in spite of its great size. This caterpillar is occasionally, but rarely, found feeding on the garden Hibiscus, and it was once taken in this district on the wild Hollyhock (*Hibiscus panduriformis*). It should be looked for from about the middle of February to the end of March. The moth itself emerges in December, and has been seen flying wildly and with great rapidity about the electric lights of the town.

The well-known Death's-head Hawk Moth (*Acherontia atropos*) is found throughout South Africa, and is common in Salisbury, especially in the vicinity of bee-hives, the moth being very fond of honey and a notorious robber of hives. Some bee keepers, so I have heard, make use of this propensity of the insect to keep natives from stealing their honey, telling the blacks that if they approach the hives the moth will soar high aloft and then swoop down upon and kill them. I know for a fact that many natives of Rhodesia believe this yarn, and they are all very much afraid of the moth. One reason for their fear may be that it is able to squeak loudly when handled; further, its strong legs are armed with spines, and if you seize the creature it may grip your fingers most unpleasantly.

The Death's-head Hawk Moth is found in many parts of the globe, and in some years a few specimens are captured in England. It is a moth of very robust make, with a large and thick body and fore-wings that are considerably broader and less pointed than those of most Hawk Moths. These wings, which have an expanse of from $4\frac{1}{2}$ to $4\frac{3}{4}$ inches, are black, dotted with small bluish-grey round scales, and varied by two wavy light bands, one near the base and the other not far from the apex, which extend from the costa to a short distance beyond the middle; there are also some short marginal streaks of a bright yellow colour. The hind-wings are yellow, with a broad sub-marginal black band and a narrow inner band of the same colour. The head and thorax are coloured like the fore-wings, and on the thorax is the remarkable skull-like mark from which the moth takes its name. The

Plate I.

Fig. 1. Acherontia atropos, Lin.
2. Deilephila nerii, Lin.
3. Herse convolvuli, Lin.

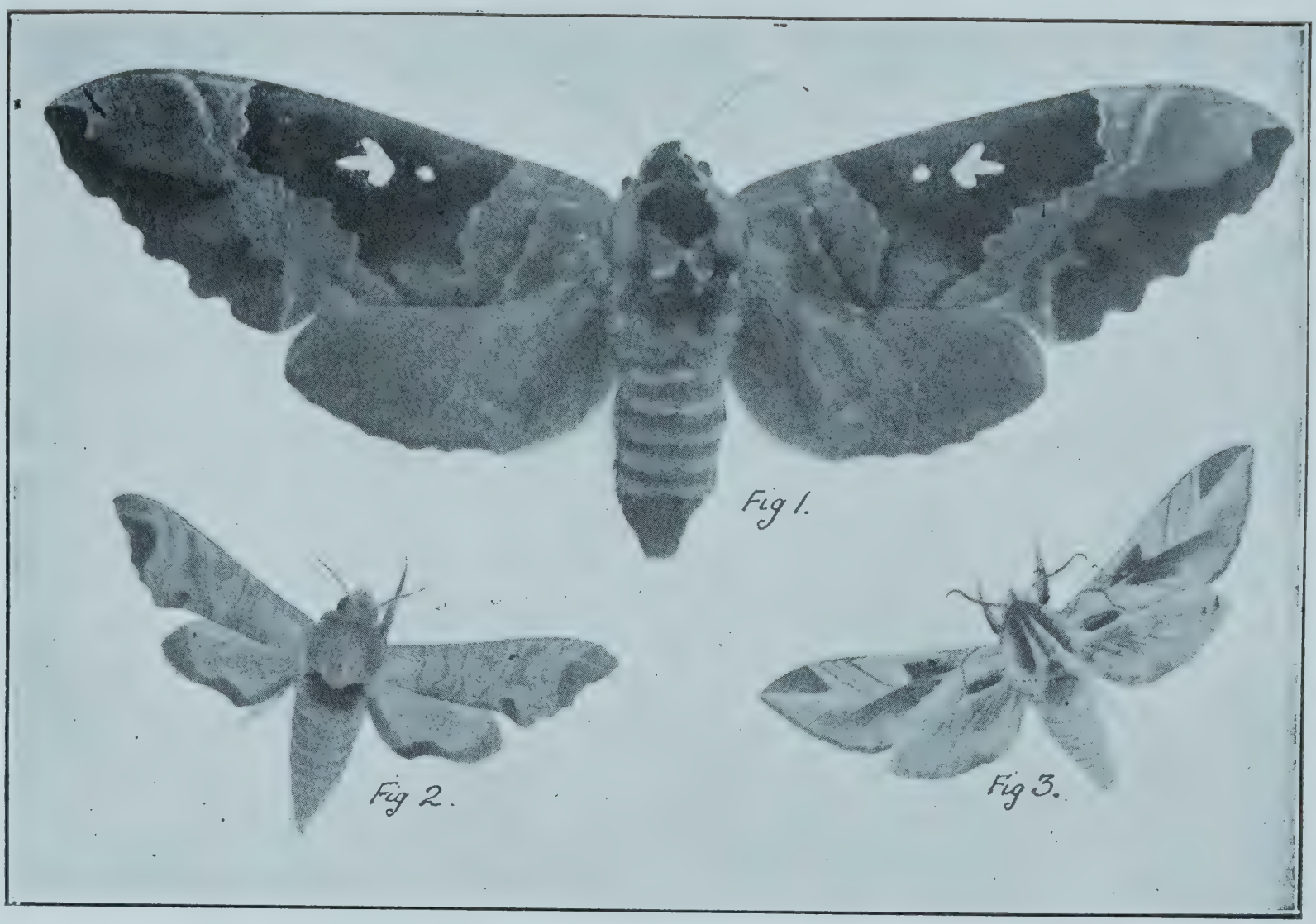


Plate II.

Fig. 1. Lophostethus dumolini, Angas.
2. Polypticus baxteri, Roths & Jord.
3. Leptoclanis pulchra, Roths & Jord.

abdomen is yellow, with a broad bluish-grey band down the middle, crossed by six black lines.

The caterpillar of this moth usually feeds on the potato plant, and when full grown is about 5 inches long. It has two very distinct colour varieties, both of which I have often seen in this neighbourhood. The first and commoner form is bright yellow, with six oblique blue or violaceous bands on each side, between which are several small round spots of the same hue. The head has a frontal black stripe and a small black spot on either side; and the apical horn is bright yellow, curved, and covered with small tubercles or warts.

The second form of the caterpillar is dull muddy brown, with two unsightly flesh-coloured lateral patches behind the head and a row of irregular fuscous or blackish marks down the centre.

These caterpillars are often to be found in potato fields, and if abundant they would probably do much damage to the crops. Fortunately they are very frequently attacked by parasites, hence the moth never appears in great numbers out here.

The Oleander Hawk Moth (*Deilephila nerii*) is a lovely moth, and, like the Death's Head, has a very wide range. In England it is a great rarity, only twenty specimens having been captured there in forty-five years. But in many parts of South Africa the moth is by no means scarce, and round about Salisbury it occurs in considerable numbers. One day last February I saw an oleander bush, nearly every leaf of which had been eaten by the caterpillars.

The Oleander Hawk is slightly larger than the Death's Head, the fore-wings sometimes expanding nearly 5½ inches. These wings are beautifully marbled by various shades of green, pink, dark purple and white. The hind-wings are a dark slate colour, with a narrow white sinuous band and a broad green margin; while the head, thorax and abdomen are dark green. The moth flies at dusk, and I have sometimes seen it in the gloaming hovering over the flowers of verbena and darting off with wonderful swiftness.

The caterpillar of this fine moth usually feeds on the oleander, but it has been found in this district on the mango. When full grown it is of stout form and slightly more than 4 inches long. The dorsal surface is light green and the sides rather darker. On each side is a fairly broad milky-white band extending from the second abdominal to the last segment, and on the third thoracic segment are two large purple eye-like spots, light pink or white in the centre. Each segment has also a dorsal row of minute round spots, light green or yellow in colour, and there is an irregular row of similarly coloured spots on each side. The spiracles are dark purple, and the horn is short and stumpy, of orange hue and extremely warty, and looks very like a diminutive carrot.

When full-fed the caterpillar suddenly loses its bright colour, becoming dark greenish-black. It then leaves its food-plant, spins a light web within which it turns into a chrysalis, and the moth emerges in about three weeks. In this country the moths come out in March.

The chrysalis is long and slender, light ochreous-yellow, and has a very distinct narrow black line down the centre, separating the wing cases.

I may mention here that all the Sphingid caterpillars which are bright green in colour undergo a remarkable change when full fed and about to leave their food-plant. Some of them become muddy brown or almost black, and one—the larva of *Pseudoclanis postica*—suddenly changes its garb to one of blue and dark purple with a broad salmon or orange-tinted band down the centre. This is undoubtedly a wise provision of Nature to render the creature inconspicuous, and so to preserve it from falling a victim to birds or other foes while it wanders about in search of a suitable spot in which to pupate. While feeding, its green colour renders it almost invisible among the foliage.

Unlike the larva of the Death's-head Moth, the caterpillar of the Oleander Hawk seems to be very seldom if ever parasitised. In this country it is to be found in January and February.

Herse convolvuli, the Convolvulus Hawk Moth, is another large representative of the Sphingidæ, rare in Britain, but very common in South Africa. In Rhodesia it is only too plentiful, and its larva does considerable damage to sweet potatoes.

This moth has narrow fore-wings, measuring from $3\frac{1}{2}$ to over $4\frac{1}{2}$ inches when expanded, of light grey colour, or grey with black patches and streaks. The hind-wings are grey, with a sub-basal elongate black mark and three sinuous black bands, the two inner ones almost contiguous. The abdomen is grey in the middle, and has on each side a series of pink, black and white transverse bands, of which the pink ones are very broad and the white extremely narrow.

The caterpillar of this moth is to be found in this country in January and February, often in great numbers, feeding on the leaves of the sweet potato. It is extremely variable in colour, but can be easily recognised by the light green or olive yellow head on which there are four narrow longitudinal black or dark green stripes. In its final instar the body of the caterpillar is apple green, light grey, ochreous or black, and it has two creamy-white bands on either side. The apical horn is recurved and fairly long, and is usually of a light salmon colour; but in black examples of the caterpillar the horn too is black.

We have in Mashonaland a slightly larger and much handsomer Sphingid moth, closely allied to the preceding, and named, until quite recently, *Herse fulvinotata*. (Systematists have lately altered the generic name to *Cœlonia*.) It is found in Natal and the Transvaal, but seems to be nowhere common. The fore-wings are light or dark brown, with darker streaks and bands, a large whitish patch near the tip, and a small quadrate yellow patch at the base. The hind-wing median and outer areas are more uniformly brown, the basal and inner-marginal portion being bright yellow, with the exception of a triangular brown patch, the apex of which almost touches the thorax. On each side of the abdomen there are four yellow square spots, separated by black bands.

This moth appears to be scarce in Rhodesia, and the only Rhodesian

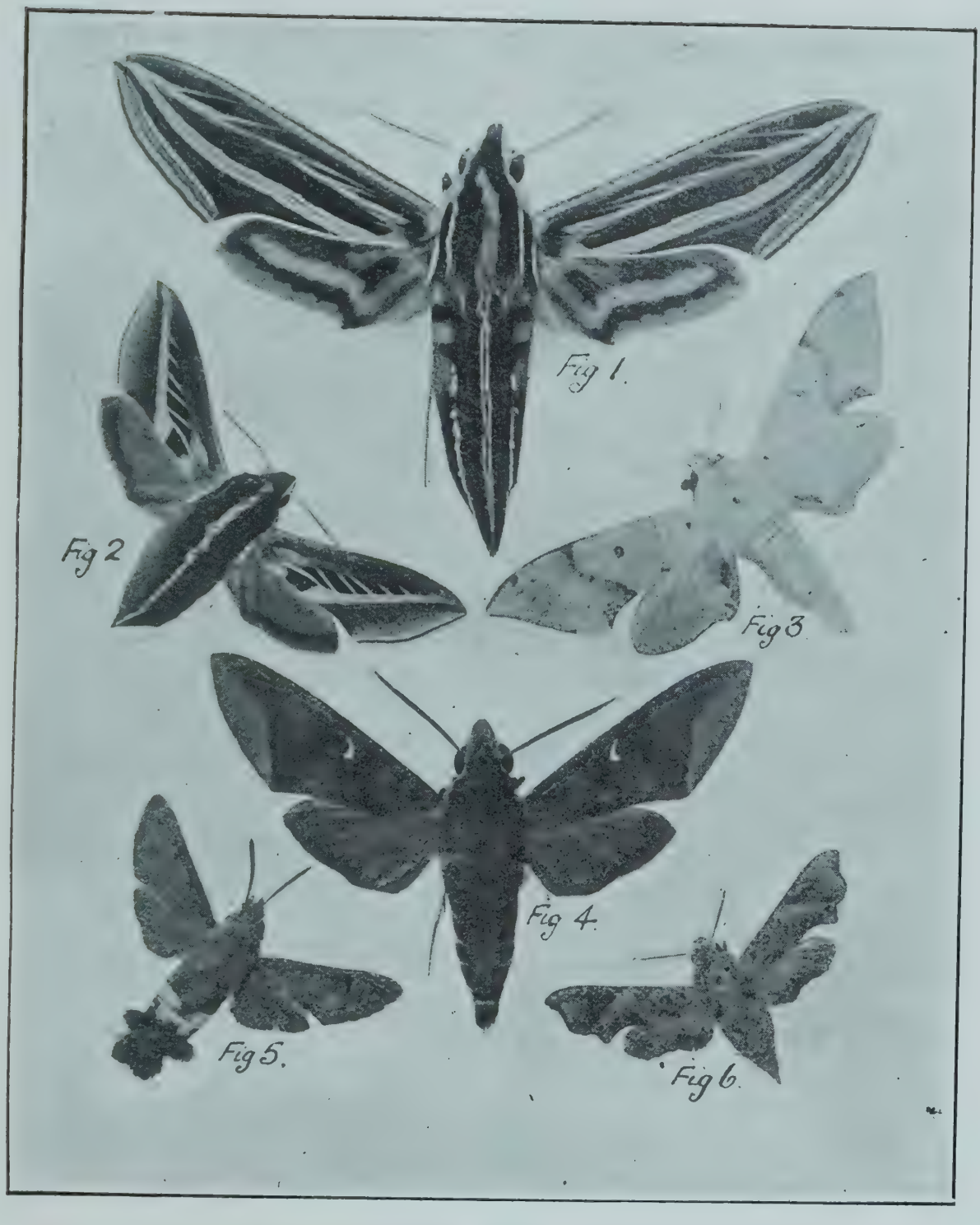


Plate III.

Fig. 1. Hippotion osiris, Dalman.
2. Basiothia schencki, Moschl.
3. Polypticus compar., Roths & Jord. (male).
4. Nephele comma, Hopff.
5. Leucostrophus hirundo, Gerst.
6. Temnora pylades, Roths & Jord.

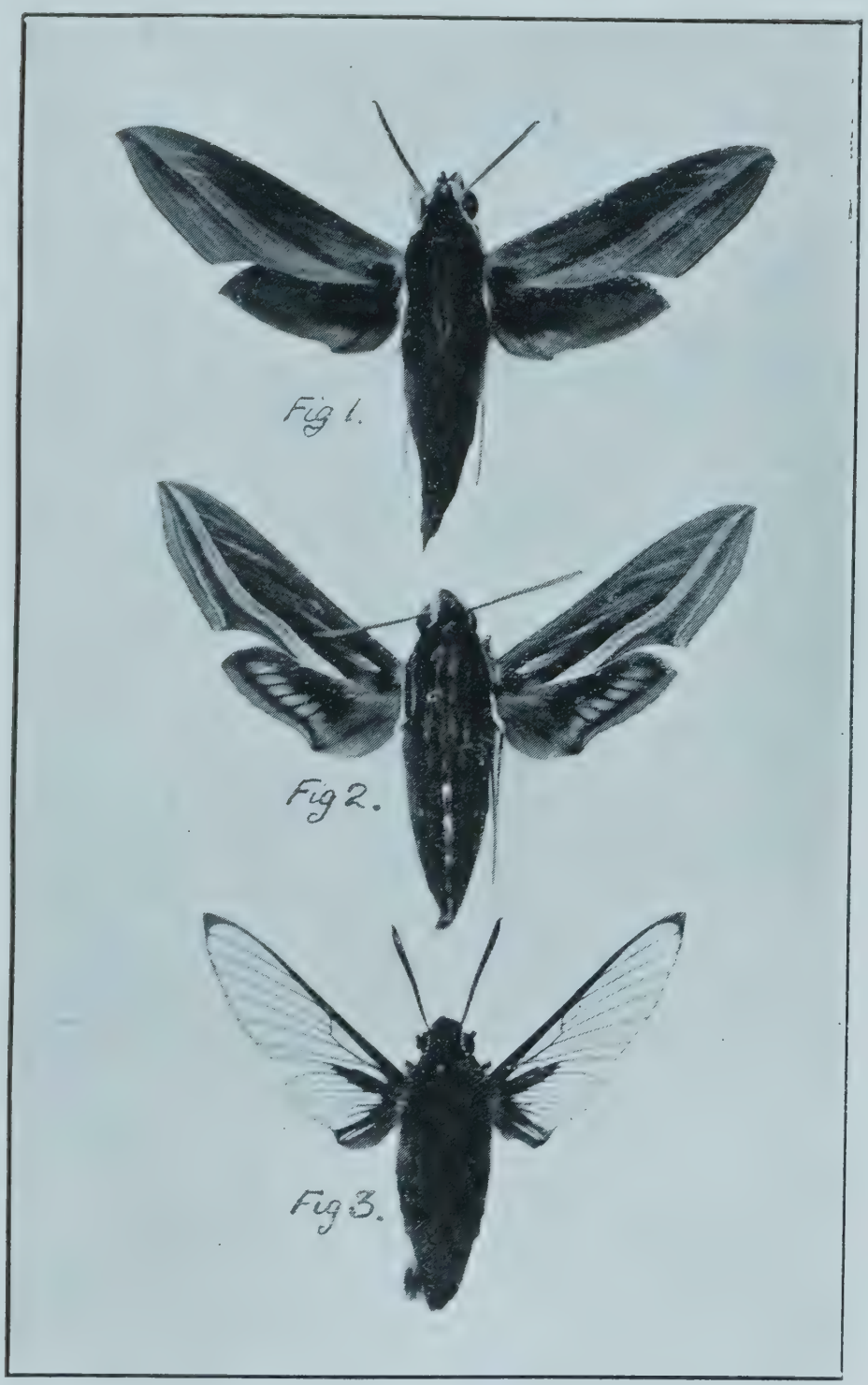


Plate IV.

Fig. 1. Hippotion eson, Cram.
2. Hippotion celerio, Lin.
3. Cephonodes hylas, sub. spec. virescens, Wllgrn.

specimens I have seen are two which were bred at Salisbury from caterpillars found feeding on the Zimbabwe Creeper.

In February of the present year a much larger Hawk Moth, resembling the preceding one in many respects, but quite distinct from it, has been found at Salisbury. It has a wing expanse of nearly 6 inches, and is therefore the second largest of our South African Sphingidæ. The fore-wings are greyish-green, with several black streaks, two elongate pink patches and a small yellow mark at the base. The hind-wings are black, with the inner or upper margin and a large basal and sub-basal patch bright yellow. The abdomen is greenish-grey in the centre, with three large square yellow spots, entirely enclosed by black bands, on either side. The moth has not, to my knowledge, been recorded from any other part of South Africa, and it may prove to be a hitherto unknown species.

A very pretty Sphingid, extremely common throughout the subcontinent, is *Hippotion celerio*, known in England as the Silver-striped Hawk Moth. It is very rare in Great Britain, but abundant out here, and its caterpillar is often a pest on vines.

The Silver-striped Hawk is a gaily-coloured moth, with a wing expanse of from 2½ to slightly over 3 inches. The silky fore-wings, which are very narrow and pointed at the tip, are grey with an olive green tinge. In the upper part of these wings are three narrow silvery streaks, and there is a broad, slightly curved, silver band extending from the tip of the wing to near the body. The hind-wings are black, with the basal area bright crimson or carmine, and a row of six elongate pink spots parallel to the outer margin. The body of the moth is greenish grey, and down the centre of the abdomen are two narrow silvery lines almost touching each other, and on each side of these there are four or five silver dots.

This pretty moth is very common about Salisbury, and often flies into rooms at night attracted by the light. After sundown it is to be seen hovering over flowers, into which it thrusts its long proboscis, and, like all Hawk Moths, it darts about with great swiftness.

The grown caterpillar is usually grass green, and on the first abdominal segment there are two large ocellate spots of a dark green colour, ringed outwardly with bright yellow, and having in the centre a number of minute very dark rings or dots. Behind each of these eye-like markings is a smaller spot, of a salmon or flesh-coloured hue, connected with the horn by a dark green narrow band. The horn itself is long and slender, nearly white except at the base, which is black, and the spiracles are flesh-coloured.

The ground colour of this caterpillar is sometimes, though not often, pale brown, and I have seen two dark purplish-red specimens. Though its ordinary food-plant is the vine, the caterpillar feeds on several different plants.

One of the rarest Hawk Moths is *Hippotion cajus*, the body and fore-wings of which are extremely like those of *celerio*; but the hind-wings are of sober hue and have no trace of the basal crimson or the sub-marginal pink spots.

We have two other species of Hippotion at Salisbury, both of them fairly common and both feeding in their larval state on the leaves of the arum lily. The first is *H. eson*, with olive brown fore-wings and bright crimson hind-wings, which are black at the base and along the margins. This species is slightly larger than *celerio*; the abdomen is longer and more slender, and in place of the two central silver lines it has a pinkish band on each side. The caterpillar resembles that of the Silver-striped Hawk Moth, but is rather larger and broader, and has a row of dark oblique marks on each side.

Our last species of this genus is *H. osiris*, a very fine Hawk Moth, considerably larger than its congeners. The body is very large and robust, and the wings measure 4 inches from tip to tip.

The fore-wings of this fine moth are olive green with a broad silvery stripe tinted with pink. The inner margin is silvery and the outer margin pink with a silvery sheen. Above the broad silvery stripe is a narrow pinkish-silver band emitting two long slender rays. The hind-wings are black, with the base and a broad longitudinal band carmine, the outer margin being usually light pink. The abdomen has two almost contiguous pinkish white lines down the centre and a silver line on each side, and the lateral and basal portion is crossed by alternate black and pink bands.

This handsome moth is, as has been said, pretty common around Salisbury; but the perfect insect is seldom captured, its flight being exceedingly strong and swift. The caterpillar is a pretty little creature in its early instars, grass green in colour, with two large eye-like spots and a long slender horn. After the final moult the body is quite black, and the ocellate spots consist of an intense black outer ring enclosing a grey circular patch within which are nine or ten tiny mauve dots. In this instar the caterpillar feeds with great voracity and doubles its size in two days. As it goes on feeding the colour becomes lighter; when full grown it is dark grey, with narrow greenish-yellow bands consisting of rows of elongate spots, and there are two larger yellow spots on each segment. The head is brick red and very small compared with the body, and the thoracic segments are unusually narrow, so that the creature appears to have a long neck, into which it can draw its head.

The fully-grown caterpillar is 5 inches long and extremely thick and soft, and the apical horn has almost disappeared. Owing to its peculiar colour and form, it has now a distinctly snake-like appearance, looking much like a diminutive puff-adder. So repulsive is its aspect that few people would care to handle it, and a friend of mine once almost sent a tame baboon into a fit by throwing one of these caterpillars at it. The same gentleman one day received a box containing a specimen of this caterpillar accompanied by a note enquiring, "Is this a snake?"

One of the most brilliantly coloured of our Hawk Moths is *Basiothia schenki*, the rich brown fore-wings of which have a broad silver stripe, from whose upper edge spring several long silvery rays. The hind-wings are bright crimson, with a sub-marginal band of brown and a very narrow marginal white band. The abdomen is unusually broad and has a narrow white line down the middle.

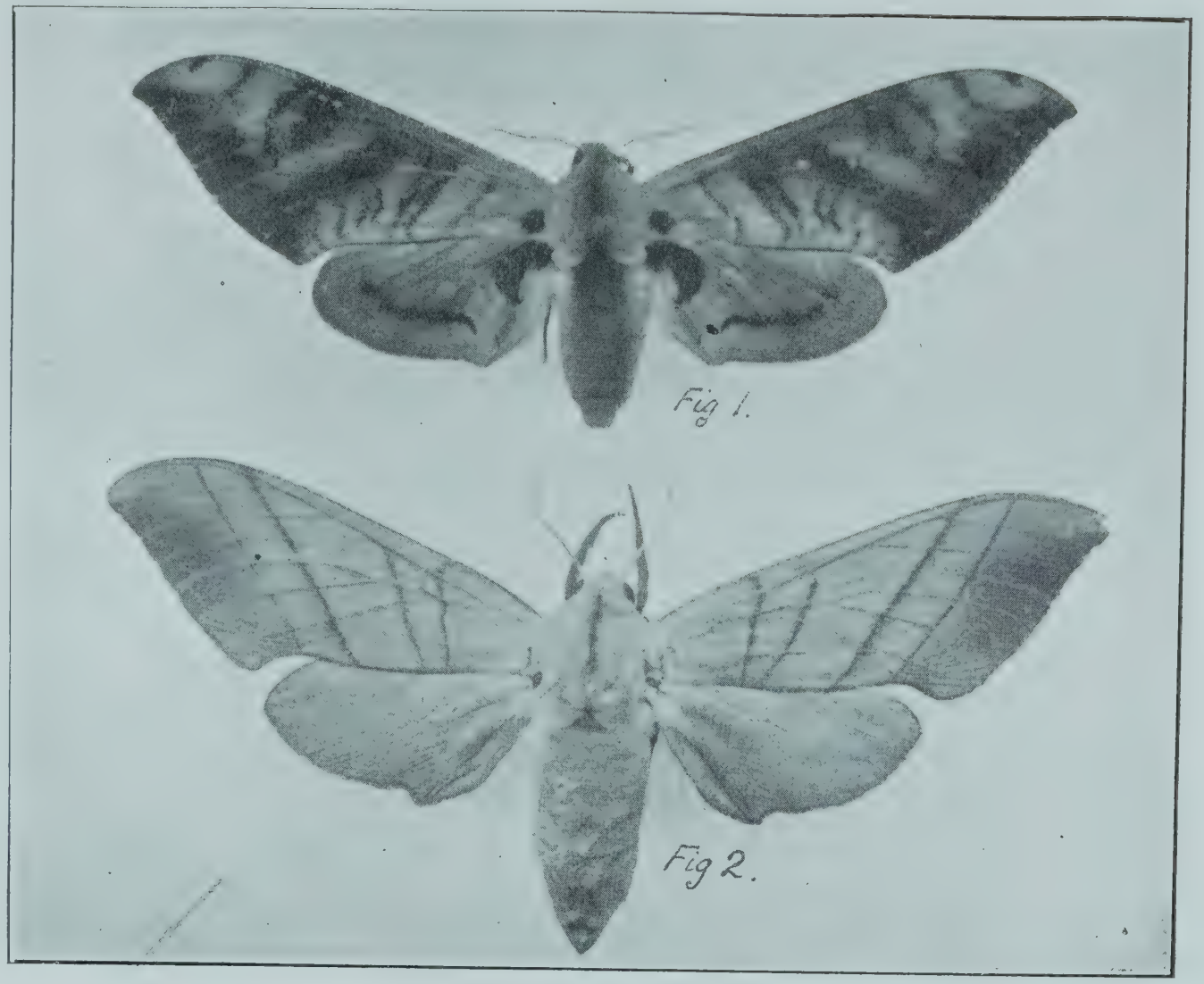


Plate V.

Fig. 1. Pseudoclanis postica, Wlk. (female).
2. A rare and undescribed species from Lomagundi, probably Polypticus species.

The caterpillar of this moth is a beautiful object, black in colour with rosy ocellate spots and other spots and marks of red and bright orange. It feeds around Salisbury on a small plant of the genus *Vernonia*. The moth has a wing expanse of about $2\frac{1}{2}$ inches, and appears to be rather scarce. I have only seen about half a dozen specimens, four of which I reared from their larvæ.

Basiothia medea is, next to *Hippotion celerio*, our commonest Hawk Moth, and resembles the preceding species in size and shape, except that it has a less robust body. But the colour is totally different, the body and fore-wings being green without any markings, and the hind-wings orange with a marginal brown band. The caterpillar is either dull green or brown and has a row of large quadrate spots of a darker tint on each side.

One of our prettiest Sphingidæ, often found at Salisbury, but exceedingly rare in other localities and not occurring south of Rhodesia, is *Leptoclanis pulchra*. The fore-wings of this moth are olive or sage green with three much darker patches, the hind-wings being carmine with a broad olive-green margin. The thorax and abdomen are light olive green, and on the former there are three broad bands of dark green. The moth has a wing expanse of from $2\frac{3}{4}$ to $3\frac{1}{2}$ inches, and it sometimes flies into rooms at night.

The caterpillar of *Leptoclanis pulchra* feeds on the Vaal Bosch (*Eriosema sp.*). It is always found on the underside of the leaves, with whose colour it harmonises so perfectly that one has great difficulty in perceiving it. The colour is sage or greyish green. Down the middle of the body there are two dull greyish-white bands, from which branch off nine oblique bands of similar colour. These bands look exactly like the ribs of the leaf on which the caterpillar feeds and add to its protective resemblance to its food-plant. The bands and the spaces between them are dotted with minute red circular spots. The head is bluish green, very robust and covered with granules, and the horn is fairly long, of yellow colour, and set with small tubercles.

Last year I found a curious colour variety of this caterpillar on the 29th April. The head and body were bright yellow, the lateral oblique bands being brighter still. The two narrow dorsal lines were replaced by a single much broader band of dull purple, and on the anterior margin of each of the oblique bands there were two purple patches, the upper one oblong and the lower triangular. The leaves of the Vaal Bosch plant on which this caterpillar was feeding had turned yellow with age, and it looked as if the peculiar coloration of the caterpillar had been given it for the purpose of concealment from its enemies. But this year I saw a similarly coloured and marked specimen on the 10th January, when the leaves of its food-plant were fresh and green, and this time the bright yellow hue rendered it a most conspicuous object even at a distance.

This caterpillar is to be found at Salisbury between January and March, and the perfect moth occasionally emerges three weeks after its larva has burrowed into the ground. But as a rule the caterpillar hibernates beneath the soil, and does not pupate until September or

October. One that I reared last year did not turn into a chrysalis until the first week in December, and the moth, a large female, emerged at the end of that month.

When rearing these moths from the larvæ it is advisable not to unearth the caterpillars during their long rest underground, as most of them die if disturbed.

Another beautiful Hawk Moth, found in the Transvaal and not uncommon at Salisbury, is *Pseudoclanis postica*. This is a considerably larger moth than the last, having a wing expanse of from $3\frac{1}{2}$ to $4\frac{1}{2}$ inches. The fore-wings are variable in colour, either light olive green, light green with much darker streaks and patches, or salmon pink with greenish marks. The hind-wings are bright yellow, with a black basal patch and a narrow curved black band parallel with the outer margin.

The caterpillar of this moth feeds on mulberry leaves, usually in March and April. It is bright grass green in colour (greyish blue in a few specimens), and closely set with small white or greenish granules. Down the middle, and close together, are two straight white bands formed of similar granules, and parallel with these there is on either side a white or golden-yellow band consisting of conical tubercles larger than the granules and connected with a much broader oblique band, usually of a light green tint, which extends from the horn to the last pair of abdominal feet. The horn is long, reddish lilac in front and behind and green at the sides, and covered with small tubercles, and the spiracles are sky blue. The head is narrow, triangular in shape, yellowish green (rarely bluish grey), granulose, and marked with four white or light yellow narrow lines. This caterpillar is very difficult to detect amidst the foliage of the mulberry trees. The moth is usually seen in spring, but specimens have been taken in this locality in January.

A caterpillar extremely like that of the above moth, but smaller and with crimson instead of blue spiracles, is the larva of *Polyptichus compar*, a Sphingid of very different colour and appearance, the two sexes of which are totally dissimilar. In the male the fore-wings are lilac grey, and they are crossed by two darker bands and an outer zigzag linear band, and in the upper central area of the wing is a circular red spot. The female is considerably larger than the male, and has a much more robust body, and the fore-wings are reddish purple, darker along the outer margin and with two broad wavy transverse bands. In both sexes the hind-wings are salmon pink. The fore-wings of an average male expand $2\frac{1}{2}$ inches, and those of a female $3\frac{1}{2}$ inches.

The caterpillar feeds on the Musasa (*Brachystegia Randii*), and is to be found in October and again in January and February. The late summer caterpillars sometimes hibernate underground; but as a rule they pupate when full fed, and some of the moths emerge in about three weeks, while others do not come out till September or October. This moth has hitherto been considered a great rarity, but it is by no means scarce in the neighbourhood of Salisbury, and is probably to be found in many parts of Mashonaland.

Another species of *Polyptichus*, which occurs in some numbers in this neighbourhood and has also been recorded from Bulawayo, is *P. baxteri*, a smaller moth than the preceding one, with deeply incised fore-wings, which are greyish green or pinkish in colour, have a large dark brown sub-triangular patch at the outer margin, and are crossed by several curved linear bands. The light reddish-purple hind-wings have likewise a dark brown patch on the hind margin close to the anal angle, and the base of the olive-green thorax is dark brown.

The caterpillar of this species looks much like that of *Leptoclanis pulchra*, but is yellowish green in colour, of different shape, and covered with yellow and carmine granules. In the neighbourhood of Salisbury this caterpillar was found in considerable numbers last January and February feeding on *Thespesia garckeana*.

We have in Rhodesia, though it is very rare in this country and elsewhere, a large and exceedingly handsome Sphingid known as *Platysphinx piabilis*. The fore-wings are pinkish yellow with olive green streaks and dots, and the hind-wings bright yellow, thickly dotted with red spots, many of them contiguous, and with a large oval black mark at the base. A few specimens of this fine moth have been taken in the Transvaal, but only two have, to my knowledge, been seen in Rhodesia. One of these I captured at night at Empandeni, near Plum-tree, about ten years ago, and the other was found at Salisbury some three years back.

Mashonaland has three Sphingidæ representing the genus *Nephele*, all of them handsome moths, though of sombre hue. The first, *Nephele comma*, is abundant around Salisbury, and is sometimes to be seen at dusk and after nightfall flying about in great numbers among orange trees in blossom. The body and wings of this moth are usually myrtle green, the fore-wings being crossed by dark bands and having an outer margin of grey or greenish grey, while the corresponding margin of the hind-wings is black. In many specimens there is, just above the middle of the fore-wing, a comma-shaped silvery-white mark from which the moth has obtained its specific name. But this distinctive mark is very often absent, and we have besides a variety of the moth in which the ground colour of the fore-wings is brownish red instead of dark green. Large examples of this moth have a wing expanse of slightly over $3\frac{1}{2}$ inches.

A second species, *Nephele vau*, is rare at Salisbury, but common near Umvuma, and also found at Umtali. It is considerably smaller than the preceding. The fore-wings are dull reddish purple in the basal area, the median part is covered by a large sub-triangular greenish-brown patch, and the hind-marginal area is pinkish. Close to the inner edge of the median patch is a V-shaped white mark. The basal half of the hind-wings is olive green, the outer half purplish red.

Nephele accentifera, our third species of this genus, is a much larger and finer moth. It is found in Natal, but not in the Transvaal, and I have only seen two Rhodesian specimens, both captured at Salisbury. The fore-wings are dark grey mottled with various shades of brown, and above their centre are three small silvery-white spots

forming a triangle whose base is almost parallel with the costa or upper margin.

The smallest but one of our local Sphingidæ, with a wing expanse of only $1\frac{3}{4}$ inches, is *Temnora pylades*, a pretty little moth with purple-grey fore-wings whose outer margin is deeply notched. The hind-wings are bright yellow in the basal area and reddish purple in the outer half. The moth is not uncommon about Salisbury, but often escapes detection owing to its small size and swift flight. Its caterpillar is very slender, grass green in colour, with two narrow, almost contiguous, white lines running down the body and slightly broken between each segment. There is also a broader unbroken white band on each side, and immediately beneath this is a row of eight oblique white lines. The horn is long and slender, the head extremely small, and the thoracic segments narrow.

I have found this interesting little caterpillar on *Leucas milanjiana*, a small creeping plant with narrow lanceolate leaves.

I must pass over with a very brief mention three other Hawk Moths, of each of which a single specimen only has been found at Salisbury. Two of these belong to the genus *Polyptichus*, one of them being a very fine and large species with a wing expanse of $4\frac{1}{2}$ inches. Its fore-wings are lilac grey and the hind-wings brick red. The other species is smaller and grey in colour. Then we have *Prædora marshalli*, a small dark grey species with black marks, whose wings are very short and broad for a Sphingid. One specimen was found at Salisbury during the past summer, and several have been taken near Umvuma.

Lastly there are the pretty Humming-bird Hawk Moths, *Macroglossa trochilus* and *Leucostrophus hirundo*, and a large Bee Hawk Moth, *Cephonodes hylas*, the last of which has transparent wings and green and yellow body.

These three moths are diurnal, and they differ from all the others in having, at the end of the abdomen, a tuft of long hair-like scales which are expanded like a fan when the moth is flying.

M. trochilus is our smallest Sphingid, expanding only about an inch and a half across the wings, and it closely resembles an English species. *Leucostrophus hirundo* is considerably larger and of more robust form. The wings are very dark grey and the body black with a broad white band across the abdomen. When hovering over flowers in the sunshine this moth looks wonderfully like a large black and white bumble bee.

Many parts of Southern Rhodesia have not yet been explored by collectors, and it is safe to predict that when they come to be worked a considerable addition will be made to the number of Sphingidæ and other large moths hitherto recorded from this Territory. As an index of what we may expect in the near future it will be enough for me to state that since I wrote last year about the Emperor Moths of this country no fewer than eight new species of these splendid insects have been discovered in the neighbourhood of Salisbury. Three of these are among the largest of South African *Saturniidæ*, and a fourth surpasses all the others in beauty.

The Food Value of the Ground-Nut.

Reprinted from *The Indian Trade Journal* of 23rd November, 1917.

The following Press Note on the above subject has been issued by the Government of Bombay :—

The ground-nut, pea-nut, earth-nut or monkey-nut (*Arachis hypogœa*) is a leguminous creeping plant indigenous to India. Although the fruit resembles a nut in that it contains fat, it is really a legume. After flowering, the stalk of the plant bends over and enters the soil, where the seeds grow and mature. These seeds are contained in paper-like pods or husks, and there are usually two, but in some varieties four seeds in each pod. For commercial use these nuts have to be decorticated, and the shell is usually broken by special machinery. The inner red skin covering the kernel is then removed as completely as possible by a blast of air. The separated and cleaned kernels are ground up and subjected to hydraulic pressure to obtain the oil. This oil, known as Arachis oil, or *Katchung oil* in India, is obtained either by two, or sometimes three expressions.

The first expression of oil takes place at the ordinary temperature, and yields a cold drawn oil, which is nearly colourless, has a pleasant taste and odour, and forms a most valuable substitute for olive oil. It keeps very well, but on exposure for some time it has a tendency to thicken, and only then does it turn rancid.

The second expression is carried out at a temperature of 30 degs. to 32 degs. C., and the resulting oil may be used for culinary purposes, for the manufacture of margarine, as a lubricant, and also for burning purposes.

The third expression requires a still higher temperature, viz., 50 degs. to 55 degs. C., and this represents a lower grade oil, which is suitable for soap-making.

After expressing all the oil the press-cake is usually sold as a cattle food, and is much valued as such, since it contains the highest protein content of all known cakes, and further has the advantage of easy digestibility. It is the purpose of this article to demonstrate the value of this cake as a food-stuff, and also the lines along which this industry may be developed with success.

In India, more particularly in the Bombay and Madras Presidencies, this ground-nut industry is a large one, and before the war the nuts were exported from India in very large quantities, chiefly to France. Here the oil was expressed (of which from 45-50 per cent. is present in the Indian samples) and used for soap-making, and the

result of this was that ground-nut oil, or Arachis oil, as it is commonly called, was cheaper in France than in India. The true kernel of the Indian ground-nut has the following composition :—

Water	7.5 per cent.
Protein	27.5 ,,
Fat (Arachis oil)	44.5 ,,
Carbohydrates	15.7 ,,
Fibre	2.2 ,,
Ash	2.5 ,,

After the Arachis oil has been removed, and the resulting cake allowed to dry in the sun and finally reduced to a fine powder, this powder has the following composition :—

Water	9.8 per cent.
Protein	44.5 ,,
Carbohydrates	23.8 ,,
Fat	9.2 ,,
Fibre	5.2 ,,
Ash	7.5 ,,

It is evident from the analysis that this ground-nut meal represents a highly nutritious food, not only for cattle, but for human beings. At present this press-cake is either used as cattle food or as a manure. Now this flour is not only rich in proteins which are essential constituents of all foods, but these same proteins have a peculiar composition, which makes them particularly effective in supplementing food products of cereals, whose proteins lack these special constituents. The proteins in our ordinary food are built up of certain amino-acids which are linked together just like the building stones of a house. Now all proteins contain these amino-acids, or building stones, but some essential ones are missing from the proteins of certain foods, and others again are present in varying proportions. Thus it has been shewn that neither animals nor men can maintain their body, weight and proper growth and nutriment when fed on maize, or certain legumes. Similarly the proteins in wheat and barley, whilst sufficient to maintain body nutriment, will not suffice to promote growth. The first two have been shewn to be due to the absence of a certain building stone, an amino-acid known as tryptophane, and the second two proteins to an absence of another building stone known as lysine. In order, therefore, to maintain proper nourishment and growth, the proteins taken in with the food must contain these two amino-acids, viz., tryptophane and lysine, and it is because meat proteins satisfy this condition that they form such a valuable food. Now it is well known that vegetable proteins will not replace animal proteins in a dietary, and hence a perfect food must be made up so that all these building stones are not only present, but also occur in suitable proportions.

Now, we find that ground-nut cake, besides containing a high proportion of protein, contains certain amino-acids in quantity. These amino-acids belong to the same group as those found to be deficient in the proteins of wheat and barley, viz., lysine. By mixing ground-nut meal with wheat flour and other cereals, we are able to add these missing building stones. Again, the particular proteins in the ground-

nut meal are deficient in the amino-acid tryptophane; so in order to overcome this deficiency we add dried milk in certain proportions. The ground-nut cake when mixed with dried milk, therefore, gives us a flour of very high protein content; these proteins contain, as far as we know, all the various building stones necessary for growth and maintenance of nutrition. We find, however, that these two constituents do not go into solution very readily, hence the flour is mixed with sodium carbonate or bicarbonate, in which the other two constituents are readily soluble. The new flour thus consists of ground-nut cake, dried milk and bicarbonate of soda. The bicarbonate of soda acts also as a preservative, and assists in the process of baking. All these three constituents can be obtained in India in any quantity, and at a very cheap rate. The materials used may be prepared with the use of the existing mill machinery, so that no additional outlay of capital is required.

Now, besides containing a large amount of protein, this new flour is rich in fat and mineral salts. Of the latter the most important feature is its richness in phosphates (phosphoric acid). In all foods mineral salts cannot be replaced by any of the other forms of nutritive material present, *e.g.*, proteins, fats and carbohydrates. The carbohydrates and fats in the food supply the chief source of energy for the production of heat and work, and to a certain extent these may be interchanged, but neither of these nutritive constituents can replace proteins in the diet. The new flour is found to be deficient in carbohydrates, so that for ordinary purposes of bread-making it is suggested that ordinary wheat flour be mixed with it in the proper proportion (3 to 1) to make up this deficiency. The resulting product has now the following composition:—

Water	...	6.8 per cent.
Protein	...	15.9 ,,
Fat	...	10.3 ,,
Carbohydrates	...	66.0 ,,
Ash	...	1.0 ,,

This represents as nearly as possible a "perfect" food, and as such approximates very closely to a patent German food sold in India before the war at Rs. 6 per pound. This flour can be made in India at about one-twenty-fourth of the cost of the German product. If the wheat flour is not added the new flour makes a valuable food for invalids, and for patients suffering from diabetes and allied conditions.

Bread made from the new flour has been subjected to analysis, and sent out for trial. The results of these trials are very encouraging, as the bread is described as pleasant to the taste, easily manipulated, and possessing good keeping qualities.

The above account represents an attempt to bring forward evidence to shew the possibilities of great improvement in the ground-nut industry. Not only can the production of Arachis oil be improved, but the resulting ground-nut cake has a very high food value. The paper-like husks serve a useful purpose for stuffing mattresses and cushions, and also as a possible source of cellulose (55 per cent.) for paper-making, or as a source of fuel. The thin brown coating over

the kernel may be used for manure, as also the ashes from the shells, if these are used as fuel. The leaves and branches of the plant form excellent fodder for cattle, and the ground-nut cake also is a valuable cattle food. From the above account it will be seen that there is absolutely no waste in the ground-nut industry, and for the oil alone the commercial value is great.

Now that the export trade is cut off, there should be a great demand for this oil in India as a substitute for olive oil, and there are several oil-crushing mills in this country capable of carrying it out. A glance at the figures of the Indian Export Trade before the war shews in what large quantities these oil-yielding nuts left the country. With the German sources of supply cut off by reason of our acquisition of most of their colonies in Africa, practically the whole trade in oil-containing seeds rests in the hands of the British Empire and America, two great allies. The whole ground-nut industry in India has, therefore, a great future if properly worked, well supervised, and advantage taken of the means of utilising all the various by-products.

For further details the reader may be referred to *Handbook of Commercial Products*, Indian Section No. 24, Calcutta, 1893; *The Commercial Products of India*, 1908, Sir George Watt; article in *Indian Journal of Medical Research*, Vol. iv., No. 4, April, 1917, page 786.

Maize Foods for the Home.

(*Concluded.*)

CUSTARDS AND PUDDINGS (*Continued*).

GREEN MAIZE PUDDING.

INGREDIENTS.

6 *Ears of green maize.*
3 *Eggs.*
1½ *Pints of milk.*
Salt and pepper.
Nutmeg.

Grate the maize, beat and add the eggs, stir in the milk, and season to taste with nutmeg, salt and pepper. Pour the mixture into a buttered pie-dish, bake in a moderately hot oven for about 1 hour, then serve with a sweet sauce. Sufficient for five or six persons.

NEW ENGLAND MAIZE PUDDING.

Ingredients.

2 *Dozen ears of green maize.*
2 *Biscuits (crackers).*
1 *Quart milk.*
4 *Eggs.*
4 *Tablespoonfuls sugar.*
Salt.

Take ears of maize (young) and score from cobs; add biscuits (pounded), milk, eggs, sugar and a little salt. Bake 2 hours in a moderately heated oven. Serve with butter.

MAIZE PUDDING.

Ingredients.

$\frac{1}{3}$ *Cup of maize meal.*
1 *Quart of milk.*
$\frac{1}{2}$ *Cup molasses.*
1 *Teaspoonful salt.*
1 *Teaspoonful ground ginger.*

Scald the milk, pour slowly on the maize meal, add the molasses, salt and ginger. Bake in a slow oven 2 hours. Serve with cream or butter. The ginger may be omitted if desired. If baked too rapidly it will not whey.

MAIZE PUDDING WITHOUT EGGS.

Ingredients.

7 *Heaping tablespoonfuls of maize meal.*
$\frac{1}{2}$ *Teaspoon salt.*
2 *Tablespoonfuls of butter.*
$\frac{3}{4}$ *Cup of molasses.*
1 *Teaspoonful ground ginger.*
1 *Teaspoonful mace.*

Pour into these 1 quart of boiling milk. Mix well, and pour into a buttered dish; just before closing the oven door pour in 1 cup of cold water. Stir quickly and close the oven. Stir two or three times to prevent the meal from settling. Bake three-quarters of an hour.

MAIZE PUDDING.

INGREDIENTS.

1 *Scant pint of maize meal.*
⅔ *Cup of bread crumbs.*
1 *Cup of molasses.*
2 *Tablespoonfuls of brown sugar.*
1 *Quart of milk.*
⅔ *Pint of cold water.*
2 *Eggs.*
1 *Cup raisins* (or not, as liked).
1 *Teaspoonful salt.*
1 *Heaping tablespoonful of butter.*
Spice (if liked).

Bake 3 hours in a slow oven. Serve with cream only.

DELICATE PUDDING.

INGREDIENTS.

1 *Quart of milk.*
2 *Heaping tablespoonfuls maize meal.*
4 *Heaping tablespoonfuls sugar.*
1 *Heaping tablespoonful butter.*
3 *Eggs.*
1 *Teaspoonful salt.*
½ *Teaspoonful ground ginger.*

Boil the milk and stir the maize meal into it; cook 15 minutes, stirring often, that the milk does not scorch. Beat together the eggs, salt, sugar and ginger; stir the butter into the milk and meal, and, when well mixed, pour this gradually on the egg mixture. Pour into the pudding dish and bake 1 hour. Serve with cream and sugar.

BAKED MAIZE MEAL PUDDING.

INGREDIENTS.

2 *Quarts milk.*
1½ *Cups (small) maize meal.*
1 *Tablespoonful flour.*
½ *Cupful suet.*
1 *Teaspoonful ground ginger.*
Sugar and golden syrup.

Put two-thirds of the milk on to boil; when boiling stir in maize meal, then take it from the fire and add the cold milk and flour. Sweeten to taste with sugar and golden syrup; add suet (chopped) and ginger. Bake in slow oven for 1½ hours.

BAKED MAIZE PUDDING (1).

INGREDIENTS.

8 *Cups milk.*
2 *Cups maize meal.*
2 *or* 3 *Eggs.*
1 *Cup sugar or treacle* (*golden syrup*).

Boil the milk and stir in the maize meal gradually. Take it from the fire, add eggs, and sweeten with sugar and syrup to taste. If whey is desired, reserve a part of the milk and add it cold. Bake in buttered dish for 2 or 3 hours.

BAKED MAIZE PUDDING (2).

INGREDIENTS.

3 *Tablespoonfuls maize meal.*
1 *Quart milk* (4 *cups*).
1 *Tablespoonful golden syrup.*

Bring 3 cups of the milk to boil, and stir in maize meal mixed together with syrup. Add one cup of cold milk for whey. Butter a deep dish and bake about 1 hour.

BOILED MAIZE PUDDING.

INGREDIENTS.

2 *Cups maize meal.*
3 *Cups milk.*
1 *Cup flour.*
½ *Cup suet.*
¼ *Cup syrup.*
2 *Cups dried apples and raisins* (if liked).
Salt.

Boil the milk, pour it scalding on the meal, add flour and suet chopped fine. Soak apples in a little warm water to swell them, and mix them in the syrup. Add the other ingredients, salt to taste, and tie in a pudding cloth, allowing room to swell. Boil or steam for 5 hours.

MAIZE BREAD PUDDING.

INGREDIENTS.

2 *Stale maize muffins* (*or maize bread*).
1½ *Pints milk.*
½ *Cupful sugar.*
3 *Eggs.*
1 *Teaspoonful* (*small*) *ground ginger.*

1 *Teaspoonful (small) ground cinnamon.*
Salt.

Steep muffins or bread in milk; when soaked squeeze rather dry, place in a bowl, beat up with sugar, a little salt, eggs and spices. Pour boiling milk over them, stirring all the time, then pour into buttered pudding dish and bake 1 hour in moderate oven. Serve with sauce.

UNITAS.

(Mexican Recipe).

Ingredients.

8 *Ears of green maize.*
1 *Tablespoonful lard.*
1 *Tablespoonful white sugar.*
1 *Teaspoonful salt.*
Pinch of cinnamon.

Grate the maize (which must be neither too green nor too ripe), melt the lard in a frying-pan, pour in the grated maize, sugar, salt and cinnamon; and fry till cooked but not browned. If too dry pour in a small quantity of milk. Take large inside green husks, place thick ends together and overlapping, put in tablespoonful of maize mixture, and fold over the leaves, forming small square packets, tied with strips taken from the leaves. Place these in a deep saucepan of boiling water and cook for half an hour. Serve hot. Enough for six people. If desired the maize mixture can be placed in a pie-dish and baked till brown.

MAIZE MEAL FRITTERS.

Ingredients.

3 *Cups of milk.*
2 *Cups best maize meal.*
½ *Cup flour.*
4 *Eggs, beaten separately.*
½ *Teaspoon soda, dissolved in hot water.*
1 *Teaspoonful cream of tartar, sifted in the flour.*
1 *Tablespoonful sugar.*
1 *Tablespoonful melted butter.*
1 *Teaspoonful salt.*

Beat the yolks of eggs very light, and add to all the ingredients (except the maize meal, flour and cream of tartar, which should be added last); when these are well mixed add the whites of eggs, next the flour mixture.

Drop into boiling lard by the spoonful; when done, lay in the draining pan with brown paper in the bottom of the pan to absorb the fat. Eat with a sauce made of butter and sugar, seasoned with cinnamon and ginger.

Sauce for Fritters.

Take 1 heaping tablespoon butter and 2 heaping tablespoons of flour, rubbed together. Add 1½ cups boiling water and cook 5 minutes. Add 1½ cups brown sugar, 1 saltspoon ground ginger, and 1 even teaspoon ground cinnamon, or, if preferred, juice of half a lemon and half a grated nutmeg. Stir till the sugar is all melted. Serve hot.

MAIZE MEAL PUFFS.

Take 1 quart boiling milk into which stir 2 small cups white maize meal and ½ cup flour, 1 small cup powdered sugar, 1 saltspoonful salt, 4 eggs (beaten separately), 1 tablespoonful butter, ½ teaspoonful soda dissolved in hot water, 1 teaspoonful cream of tartar sifted into the flour, ½ teaspoonful mixed cinnamon and nutmeg. Boil the milk and stir in maize meal and flour, boil 10 or 15 minutes, stirring carefully to prevent scorching, then add the butter. Remove from the fire and beat hard. When cool add eggs, sugar, spices and soda, and beat hard; bake in greased cups or deep gem irons.

To be eaten with the following sauce:—Take ½ cup butter beaten very light, 1 cup powdered sugar, 1 cup cream. Set the dish in a basin of hot water and stir until it is all like cream; it will take but a short time.

HOMINY CROQUETTES.

Ingredients.

1 *Cup hominy.*
1 *Tablespoonful melted butter.*
1 *Cup milk.*
1 *Teaspoonful white sugar.*
2 *Eggs.*

Add to boiled hominy melted butter, stir, and moisten by degrees with milk. Beat to light soft paste. Rub in sugar and egg. Roll into balls with flour on hands, dip in beaten egg and bread crumbs, and fry. Serve with sauce or sugar or fruit syrup.

CAKES.

DOUGH NUTS OR CRULLERS.

Ingredients.

2 *Cups flour.*
2 *Cups maize meal.*
1 *Teacup sugar.*
2 *Eggs.*
2 *Teaspoonfuls cream of tartar.*
1 *Teaspoonful soda.*

Milk.
Spice and salt to taste.

Mix ingredients well together, using enough milk to make a stiff batter to drop from spoon. Fry in deep fat.

GOLDEN JOHNNY CAKE.

Ingredients.

Fine grain squash or pumpkin or ripe marrow.
1½ *Pints sweet milk.*
3 *Cups maize meal.*
1 *Cup flour.*
2 *Teaspoonfuls baking powder.*
½ *Teacupful raisins.*
1 *Teacupful currants.*
Butter.
Sugar.
Salt.

Steam and mash squash or pumpkin with a little butter, thicken milk with squash pulp until like thick cream, and sweeten slightly with sugar. Add maize meal, flour, baking powder, raisins, currants and a little salt. Bake well in moderate oven.

MAIZE MEAL PATTY CAKES.

Ingredients.

½ *Cup butter.*
2 *Cups sugar.*
2 *Cups maize meal (or ground Fanko).*
1 *Cup flour.*
2 *Teaspoonfuls baking powder.*
4 *Eggs.*
½ *Cup sweet cream or milk.*
1 *Teaspoonful lemon extract, or any flavouring to taste.*
Little salt.

Beat the yolks of eggs and sugar, add butter (warmed), and the dry ingredients sifted together. Add the cream or milk and flavouring; lastly fold in the beaten whites of eggs and bake in well-greased patty pans in hot oven for about 10 minutes.

"CORN" FLAKE DROP CAKES.

Ingredients.

2½ *Cups of freshly toasted "corn" flakes.*
3 *Eggs.*
⅓ *Cup of sugar.*
Salt.

Beat the yolks of eggs, adding sugar; before beating the whites add a pinch of salt, and when very stiff carefully fold in the beaten yolks, and, last, the "corn" flakes. Drop on to buttered tin from a teaspoon. The oven must not be very hot.

COCOA TEA CAKES.

Ingredients.

3 *Eggs.*
1 *Cup sugar.*
⅓ *Cup butter.*
½ *Cup milk.*
½ *Cup flour.*
½ *Cup maizena or corn-flour.*
3 *Teaspoonfuls (level) baking powder.*
¼ *Cup cocoa.*
½ *teaspoonful vanilla.*

Beat eggs (yolks and whites separately), then cream with sugar and butter. When smooth and light, add milk, flour and maizena sifted with baking powder and cocoa. Beat well, add a little salt and vanilla. Put in muffin pans, sprinkle with chopped nuts or desiccated cocoanut, and bake in a moderate oven.

CORN-FLOUR* CAKE.

Ingredients.

2 *Cups granulated sugar.*
½ *Cup butter.*
1 *Cup milk.*
Whites of 7 eggs (or 4 whole eggs).
2 *Cups wheaten flour.*
1 *Cup corn-flour or maizena.*
2 *Teaspoonfuls baking powder.*

Take sugar and butter and stir to a cream; add milk, eggs well beaten, wheaten flour, corn-flour, and baking powder. Flavour with extract of almond, lemon or orange.

MAIZE MEAL CURRANT CAKE.

Ingredients.

1 *Cup maize meal.*
1 *Cup flour.*
1 *Cup sugar.*
3 *Eggs.*

*Corn-flour or maizena can be obtained from any grocer. It is an American preparation from maize.

1 *Cup currants.*
½ *Cup butter.*
½ *Cup milk.*
1 *Teaspoonful baking powder.*
Salt.
Flavouring to taste.

Cream, butter and sugar, then add eggs well beaten. Sift maize meal, flour, salt and baking powder together, and add alternately with milk; lastly add currants and flavouring. Bake in a moderate oven for about three-quarters of an hour.

MAIZE MEAL SANDWICH CAKE.

INGREDIENTS.

4 *Eggs.*
Their weight in sugar and butter.
Half their weight in maize meal.
Half their weight in flour.
Salt.
Flavouring to taste.

Beat sugar and butter to a cream, add eggs well beaten, and gradually mix in maize, flour and salt sifted together; lastly put in flavouring. Bake in separate moulds for about ¼ hour or 20 minutes; when cool spread jam between layers, and cover with icing.

SWEETS.

CANDIED POP CORN.

First wet your pop corn, then put into a saucepan with lid on, or a corn-popper. When your corn has been popped proceed to make the syrup as follows:—Put into saucepan 1 tablespoonful butter, 1 teacupful sugar, and 3 tablespoonfuls water. Boil (without stirring) until it threads from spoon, then add popped corn, and stir well till candy is evenly distributed. Remove from fire and continue stirring until every grain is separate and crystallised.

CRACKER JACK.

INGREDIENTS.

1 *Cup molasses or syrup.*
2 *Cups sugar.*
1 *Tablespoonful butter.*
2 *Tablespoonfuls vinegar.*
½ *Teaspoonful bicarbonate soda.*
Pop corn and peanuts (monkey nuts).

Boil together molasses, sugar, butter and vinegar until it cracks when tried in cold water; then take from fire, add the soda, beat briskly, and pour over freshly-popped corn or popped corn and chopped peanuts.

PRESERVING MAIZE.

CANNED MAIZE.

Cut maize from cobs. To one quart of maize add one teaspoonful each of salt and sugar. Put maize into fruit jars and pack as closely as possible. Adjust rubbers and set cover on loosely without sealing. Set the filled jars on a perforated board in bottom of boiler and cover to about one-third their depth with water. Cover the boiler, and steam for two hours. After one hour's steaming the contents of jars will have contracted; therefore use the contents of several jars to completely fill the others, and fill jars to overflowing with boiling water. Steam one hour longer and seal.

FRESH CANNED MAIZE.

Pack alternate layers of maize, cut from the cobs, and salt into fruit jars and press together firmly. Cover closely and set away. Before using soak the maize in water to remove salt. This method is very simple, and is said to give satisfaction.

CANNING MAIZE.

Cut the maize from the cob. Boil in sufficient water till well done. Dissolve 1 oz. of tartaric acid in $\frac{1}{2}$ pint of boiling water. Add 1 tablespoonful of the tartaric solution to each 2 quarts of the maize, and bottle. When wanted for use pour off water, cover with fresh, adding $\frac{1}{2}$ teaspoonful soda to a quart bottle, bring to boil; turn this water off, add water again; if the maize still tastes sour, add soda and boil again. When the acid taste is gone, add 1 teaspoonful sugar, cook till done, season with pepper and salt, add a little cream or milk and butter, and serve.

CANNED MAIZE.

Cut maize from the cobs, and pack as tightly as possible in glass jars; there should be at least 2 inches juice in each can. Screw the lids on without the rubbers. Prepare the boiler by laying sticks or straw on the bottom, put the jars in and surround them with straw so that they do not touch against each other. Fill the boiler with cold water up to the lids of jars, boil for 3 hours, then remove, put on rubbers, screw down tightly, return to the hot water and boil another hour. If directions are followed carefully there will be no failure.

DRIED MAIZE (for Winter Use).

Husk the maize, put into kettle of boiling water, and cook for 3 to 5 minutes, to set the milk in the kernels. Then cut from the cob, and, with the back of the knife, scrape the cob to get all the milk, and spread in shallow pans. Dry in slow oven or in the sun. When perfectly dry put into paper bags. Before using soak the maize overnight.

Maize dried in this way retains more of its sweetness, is much easier to prepare, and takes less space in the pantry than if canned and bottled.

PICKLED MAIZE (for Winter Use).

Cut green maize from the cob and pack in a stone jar in the proportion of 1 pint (2 cups) of salt to two quarts (8 cups) of maize until the jar is full; then put a weight on top and cover closely. As wanted for use soak out the salt with fresh water, pour on boiling water the first time to seal up the milk in the maize, then using cold. When freshened cook like green maize.

The Agricultural Outlook.

So far as stock are concerned, the prospect for the winter is exceptionally good. Abundant water and unusually late and plentiful pasturage should make it easy to carry all flocks and herds through to the spring in good condition. In several districts there have been losses among sheep due to liver sickness, and there has been some mortality among young and weak cattle as a result of exposure to incessant rain, as well as a good deal of three-day or stiff sickness, but accompanied by little mortality. These troubles are, for the most part, disappearing with the rains, and stock owners anticipate the dry season with confidence.

In regard to crops, as stated in our last issue, it has been impossible to make up for early losses by late plantings, the rains persisting for too long a period. However, district reports in the main agree that actual damage to standing crops has been less than was feared. Vlei lands have suffered severely, and in many parts the crops on sand veld are said to be total failures, but on well-drained red and black soils crops are stated to be above the average. In other words, such crops as are standing may be expected to reap well, but the acreage to be harvested will be comparatively small.

Correspondence

DESTRUCTION OF BABOONS.

To the Editor,
Rhodesia Agricultural Journal.

Dear Sir,

In the February number of the *Agricultural Journal* I notice you print methods of poisoning baboons. Perhaps some of your readers who are troubled with baboons would try the following, used with more or less success in the Cape:—

(1) Put a few raisins where the baboons can get at them, and, when these are taken, put down some more with strychnine inside (a few grains or crystals) each or some of the raisins.

(2) Get some ordinary detonators (used in blasting) and fill with honey or treacle, and scatter where the baboons frequent. They chew the detonators with disastrous results, and soon depart for pastures new.

Baboons are very cunning, and methods successful in some places fail in others.

Yours, etc.,

G. F. Robertson.

Victoria,
9th March, 1918.

[*Note.*—Both methods seem promising, but we must warn those unaccustomed to handle detonators that the greatest caution must be exercised in using them. A pin-scratch on the fulminate inside the metal or a blow on the metal itself will cause the "cap" to explode, with very serious results. With care, however, soft material such as treacle or honey could safely be inserted. The bright copper should attract the baboon's attention, and the sweet stuff inside induce him to bite the detonator, after which he will not, we venture to think, be in a position to depart, as our correspondent says, "to pastures new," but may renovate the local pasture.—Ed., *R.A.J.*]

Arsenite Cattle Dip.

HOW TO MIX.

We recently published instructions giving details of the quantities of arsenite of soda (80 per cent. arsenious oxide) to be used in preparing cattle dipping solutions for three-, seven- and fourteen-day dipping respectively. For convenience, these are reprinted below, and we also give here instructions as to the best method of mixing the arsenite and water.

First dissolve the arsenite in a sufficient quantity of hot water to dissolve the crystals completely. Then add water to make up to 400 gallons, stirring vigorously the while.

Although it will probably be found most convenient to dissolve the arsenite in a few gallons of hot water, this may be carried out in a short time with cold water in the following manner:—

Place two or three pounds of arsenite in a bucketful of water and stir vigorously for five or ten minutes. Allow any undissolved particles to settle, and pour off the liquid into a tank. Then add more arsenite to that remaining in the bucket and fill up with water again; repeating this till all the arsenite is dissolved.

Have proper weights and scales, and be accurate in measuring the arsenite. Always keep arsenite under lock and key as a dangerous poison. All arsenite must be completely dissolved before being added to the dipping tank.

Solutions prepared as above can be added to tanks now containing arsenical proprietary dips.

For three-day dipping—

4 lbs. arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

For seven-day dipping—

8 lbs. of arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

For fourteen-day dipping—

12 lbs. arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of water.

Veterinary Report.

January, 1918.

AFRICAN COAST FEVER.

Victoria District.—The following mortality occurred at the infected centres:—Glenlivet, 55; Erichsthal, 8; Commonage, 20; M'sari, 37; Arawe, 3; Beza, 26. The heavy rains interfered considerably with dipping and other operations.

QUARTER-EVIL.

The following mortality in cattle was reported:—Bulawayo, 4; Plumtree, 2; Figtree, 8; Matobo, 4; Umzingwane, 8.

HORSE-SICKNESS.

Following mortality reported:—Melsetter, 4; Nyamandhlovu, 2; Plumtree, 6.

ANTHRAX.

An outbreak of anthrax occurred in the northern section of the Makoni district in a herd of cattle *en route* from Mtoko to Headlands Station for Gatooma. About 30 animals succumbed; arrangements were made for the vaccination of the remainder. One case was discovered in the Mtoko district in a herd near the Native Commissioner's station.

STIFF SICKNESS (THREE-DAY SICKNESS).

This complaint was reported from various districts. No mortality.

MALLEIN TEST.

The following animals were tested with mallein on importation, with negative results:—Horses, 7; mules, 7; donkeys, 66.

IMPORTATIONS.

From the Union—heifers, 129; sheep and goats, 2,747. From the United Kingdom—1 pig.

EXPORTATIONS.

To Union of South Africa *via* Bulawayo—slaughter oxen, 39; *via* Liebig's Drift—slaughter oxen, 22; donkeys, 4; sheep and goats, 294; pigs (breeding), 7. To Congo—donkeys, 18; horses, 1; sheep and goats, 205. To Northern Rhodesia—sheep and goats, 215.

February, 1918.

AFRICAN COAST FEVER.

Mazoe District.—On 16th February the Government Veterinary Bacteriologist reported that the microscopic examination of smears from a dead ox on the farm Burnleigh, in the Shamva section of the Mazoe district, shewed appearances suspicious of Coast Fever. On 20th idem two animals were destroyed, both of which shewed undoubted microscopic lesions of the disease. The usual procedure of temperaturing the herd and short-interval dipping was at once instituted. Two oxen shewing high temperatures were destroyed. So far the infection is mild, the result no doubt of the use of the dipping tank. The farm records shew a number of deaths from July of last year. These were attributed to the effects of the unusually severe winter season and subsequently of the constant and exceptionally heavy rains.

Victoria District.—Two extensions of infection occurred during the month, viz., on the farm Riverside, involving 49 head, and on the farm Brooklands, involving 618 head; both farms adjoin the infected commonage, and in each case one animal was infected. At the other centres of infection in the district the mortality shewed a marked falling off, being 47 head, compared with 147 in January, this notwithstanding the difficulty in carrying out dipping owing to the phenomenal rainfall.

Salisbury, Umtali, Mrewa and Melsetter Districts.—No cases occurred at any of the infected centres. As in Victoria district, the heavy rains interfered considerably with dipping operations.

QUARTER-EVIL.

The following mortality in cattle was reported:—Bulawayo, 3; Umzingwane, 11; Plumtree, 9; Inyati, 3.

ANTHRAX.

One case of anthrax occurred in a herd of native cattle a few miles distant from the Native Commissioner's station, Mtoko.

STIFF SICKNESS (THREE-DAY SICKNESS).

This disease still prevails in all districts. The number of animals affected is not very great, and no mortality is reported except from Umtali district, where several deaths occurred amongst young stock, but the actual cause is attributed to exposure during the heavy rains rather than the direct result of the disease.

MORTALITY IN CALVES.

The Cattle Inspector, Insiza, reports as follows:—"Wet weather has caused a heavy mortality amongst calves on farms where no dipping tanks exist. I do not estimate the losses amongst dipped cattle at more than 5 per cent.; amongst undipped stock, as high as 25 per cent., in more than one case chiefly from liver sickness."

HORSE-SICKNESS.

A number of cases of horse-sickness was reported from various districts, and a particularly heavy mortality from Melsetter.

The Government Veterinary Bacteriologist reports that of the 130 Police horses inoculated last year, and distributed to the various stations throughout the country, 17 shewed horse-sickness re-action during January, all of which recovered.

MALLEIN TEST.

The following animals were tested with mallein on importation, with negative results:—Horses, 10; mules, 3; donkeys, 12.

IMPORTATIONS.

From the Union—bulls, 6; horses, 16; mules, 3; donkeys 12; sheep and goats, 2,140.

EXPORTATIONS.

To Union of South Africa—slaughter oxen, *via* Bulawayo, 155, *via* Liebig's Drift, 85; horses, 4; pigs, 110; sheep and goats, 76. To Belgian Congo—cows, heifers and calves, 41; bulls, 1; donkeys, 2; sheep and goats, 65. To Northern Rhodesia—mules, 2; pigs, 4; sheep, 123.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

April.

BEE-KEEPING.

Where numbers of the bee-louse are seen attaching themselves to the legs of bees and also among the quilts which cover the frames, this pest can be controlled by crushing them with the finger. In the cooler districts, crates that are partially filled with honey should be removed, and into the lift which they occupied plenty of warm clothing should be snugly packed.

CITRUS FRUITS.

During the early part of this month autumn budding can still be performed if sap is still up; in fact, if the season is late this operation is better done a little late than early, as in the event of late rains occurring, followed by a warm spell, the buds are liable to start growing, but are soon checked, the result of which is usually a stunted tree. Water by irrigation should be supplied to bearing orchards, unless unusual soaking rains have fallen late in season, followed by thorough cultivation and hoeing around trees. Continual watch must still be maintained for fruit-eating and codling moths. Spraying or fumigating against insect or other pests should not be neglected. Some early varieties may be expected to be ripening towards the end of this month.

CROPS.

The rains are practically over by this month, and the harvesting of early crops, such as buckwheat, linseed, teff grass and manna, will commence. The silo pit should be got ready, and the making of ensilage should be undertaken during this month. Napier's fodder can now be cut for this purpose. Veld hay for feeding should not be cut later than the end of this month. All lands that are available should be ploughed. The preparation of vleis for winter crops should be continued, and late crops, such as Algerian oats, should be sown this month; also barley for an early green crop.

DECIDUOUS FRUITS.

Orders should be given to the nurseryman for trees required in August, September or October. Trees will be lifted in August, and may with advantage be kept in cool storage till required.

ENTOMOLOGICAL.

Maize.—"Earworms" are sometimes troublesome in the tassels and ends of the cobs, but this pest cannot be directly attacked. Caterpillars may attack the crop, on account of their food being suddenly destroyed by late cultivation after the weeds have been allowed to get too far ahead.

Tobacco.—Any remaining plants shewing stem borer attack should be removed and burnt.

Potatoes.—Should be systematically cultivated and hilled, to keep tuber moth from tubers.

Cabbage Family.—Plants of this family are liable to suffer severely from cabbage louse and Bagrada bug.

Beans and Cowpeas.—Insect attack on these plants is but little obvious during April.

Dhal.—Suffers much from blister beetles destroying the blossom during April. Hand picking is the only remedy.

Citrus Trees.—Collect and destroy infested fruit, to keep down citrus codling.

FLOWER GARDEN.

Sow sweet peas. Hardy annuals, such as candytuft, cornflower, eschscholtzia, gypsophilla, larkspur, mignonette, poppy, etc., may be sown in the open ground, and should not be transplanted. Perennials may be sown in boxes.

FORESTRY.

Prick out into tins the young trees raised from the seed sown in February. Any breaking up left over from last month should be completed this month; also any fire lines left unploughed.

POULTRY.

Adult stock should have completed the moult by now, and may be put on a laying ration. Breeding pens should be mated up. If pullets are used in the pens they should be mated with a two-year-old male bird. Any birds which have not completed the moult should not be used in the pens. Do not breed from all and sundry. Carefully select your breeding stock, and handle each bird. Discard all with crooked breast-bones, wry-tails, in-knees, crooked toes or other serious defects. Select as many as possible that have already started to lay. Remember the male bird is more than half the pen. Above all, do not give your breeding birds a forcing laying food; it is not the quantity of eggs you should look for, but the quality. Spring hatched birds from Australia may now be imported.

STOCK.

Cattle.—Cattle on the ranch should require little attention beyond dipping. Bulls should be kept out of the herd if January calves are not desired. Dairy cattle will require a ration of crushed or ground maize and some succulent food, such as green maize stalks, Napier's fodder or ensilage, if any of the latter has been left over from last year. Calves should be supplied with green fodder and a ration of maize meal, together with some more nitrogenous food, such as bean meal, pea meal, buckwheat meal, or linseed meal. Care should be taken to provide supplementary food to all cattle before they lose any appreciable amount of flesh, in order that mid-winter may not find them in poor condition. All preparations for making ensilage should be completed by the beginning of the month. Any haymaking still undone should be attended to without delay, weather permitting. Attention should be given to water supplies for winter, and arrangements made to prevent water holes, etc., being trodden in as the supply shortens.

Sheep.—If grass seeds are troublesome, an area should be mown for grazing. Sheep should not be allowed to graze in the vleis. If the ram is put in now, lambs will be born in September, which may be considered somewhat early by some breeders.

TOBACCO.

Tobacco curing should be completed this month.

VEGETABLE GARDEN.

Potatoes require ridging and tomatoes staking and tying up. Potatoes which mature after the rains may generally remain in the soil and be lifted as required. Vegetables planted out for winter crops should be well and continuously cultivated, which will bring them along quicker, with less watering. Beans and peas should be staked and tied. Beans, carrots, cabbage, cauliflower, peas, turnip, spinach, beet and radish should be sown for late winter crops.

VETERINARY.

Horse-sickness will be prevalent this month, as will blue tongue in sheep. The first symptom is laminitis, the second a protruding blue tongue.

WEATHER.

Along the higher ridges of the country we may still look for an inch of rain, more or less, during the month, though little, if any, can be expected in the Zambesi and Limpopo valleys and all low-lying parts of the country. As often as not, however, April is a dry month. In past years it has occasionally happened that early frosts have been recorded which put an end to the tobacco harvest, and may kill tender vegetables and flowers; but, as a rule, no such calamity need yet be expected, and if at all, only in frosty hollows.

May.

BEE-KEEPING.

The scarce supply of nectar, due to conditions of drought, will be responsible for a deficiency of stores. Where this is noticed, steps must at once be taken to supply the bees with artificial food in the shape of syrup. A feeder must be placed above the frames inside the hive. Never feed bees outside, as it promotes robbing.

CITRUS FRUITS.

Continue irrigating bearing orchards up to within three weeks of picking fruit, followed by cultivation and hand hoeing. The same remarks as in April apply concerning insect pests, etc. Washington Navel oranges will be ripening this month, and possibly some early ripening seedlings.

CROPS.

Crops such as summer wheat will be ready for harvesting. Majorda melons should be carted to some convenient spot, but not heaped. Ploughing should be continued on all available lands. Winter crops in vleis, such as Early Gluyas and other wheats, New Zealand oats and barley, should all be sown not later than this month. Napier's fodder may still be cut for ensilage during this month. This will give time for a considerable after-growth, which can serve as winter pasture.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

Dhal.—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

FLOWER GARDEN.

Sow *in situ* cornflower, larkspur, mignonette, poppy; sweet peas may also be planted.

FORESTRY.

Complete pricking out into tins. Strike cuttings of species that are propagated in this manner, such as poplars. If it is intended to use the saltpetre method of eradicating stumps, the trees should be felled this month.

POULTRY.

If the means of incubation is limited, hatch the heavy breeds first, as they take longer to mature. Hatch as early as possible, to get your birds well grown before the rains, as they will make very much better development during the dry months. Do not breed from turkeys till they are fully matured. Two-year-old hens and a three-year-old male bird will be found to give the most satisfactory results. Very heavy male birds should not be used. As is the case with fowls, in breeding for size, we get this from the hens, which should be large and possessing straight keels. Get the turkeys on to lay as soon as possible. Eight or nine-month-old birds are the best for market purposes.

STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. Dairy cattle should be treated much the same as is recommended for April, but the ration should be increased somewhat, especially the succulent portion. Grass may still be cut for bedding, and both cows and calves should be well bedded down at night from now onwards. Maize will probably be in fit state for making into ensilage, and towards the end of the month maize hay may be made after the removal of the cobs. The vines of monkey nuts when reaped should be carefully preserved for fodder. Cowsheds should be put in good repair against the cold winter nights.

Sheep.—The vleis having dried, sheep will probably do better in the lower lying lands. If the ram is put in now, lambs will be born in October, which is usually a good month to arrange for. Those who favour winter lambs, and have ewes lambing now, will find a few handfuls of maize a great help to the ewes in providing milk.

TOBACCO.

Tobacco will be sent to the warehouse this month. The work of preparing the land for the next crop should now be taken in hand. The stalks of the old crop should be taken out and burnt.

VEGETABLE GARDEN.

Sow broad beans, peas, lettuce, spinach, parsnips, carrots, radish and beet. Constant cultivation is necessary.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

The dry season should have now set in, though averages of from a quarter of an inch to three-quarters are indicated in the official reports. Ground frosts at night have been recorded, but are very unusual.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY.

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1918	January	4·82	0·30	0·01	0·16
1918	February	5·16	0·35	0·04	0·19

TEMPERATURES.

Station	January		February	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	78·8	53·0	80·0	53·4
Hartley—				
Gatooma	89·9	63·2	81·1	63·0
Hallingbury Farm	77·5	63·0	81·2	62·5
Hartley Hospital	78·2	62·5	79·7	62·3
Idaho Farm	79·0	61·0	—	—
Lomagundi—				
Eldorado Mine	74·45	62·5	77·3	62·4
Sinoia	83·1	70·3	81·6	69 5
Sipolilo	77·9	64·6	77·1	61·1
Mangwendi—				
Kwenda Hospital	—	—	—	—
Mazoe—				
Shamva Mine	79·13	63·6	79·6	63·9
Melsetter—				
Melsetter	72·1	58·3	71·6	58·3
Mount Selinda	74·0	61·5	75·0	62·0
Vermont	74·4	63·0	—	—
Salisbury—				
Chishawasha	75·4	62·0	78·0	61·2
Salisbury (Gaol)	—	—	—	—
Umtali—				
Public School	77·5	62·0	80·9	65·3
Summerfield	—	—	—	—
Victoria—				
Eythorne	80·5	59·0	80·3	60·0
Morgenster	—	—	—	—
Victoria	79·3	63·0	—	—

TEMPERATURES—*(Continued).*

Station	January		February	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	79·0	62·8	—	—
Garth	80·1	62·8	81·6	61·3
Plumtree School	—	—	—	—
Retreat	84·7	64·3	88·4	63·4
Bulawayo—				
Observatory	—	—	—	—
Gwanda—				
Antelope Mine	78·8	63·0	83·1	64·6
Mazunga	81·3	65·3	88·3	68·1
Tuli	—	—	—	—
Gwelo—				
Gwelo	—	—	—	—
Gwelo (Gaol)	74·1	57·9	71·8	56·0
Matobo—				
Holly's Hope	78·3	62·1	—	—
Rhodes Matopo Park ...	76·5	60·1	81·0	61·3
Umzingwane—				
Essexvale	75·51	61·8	78·0	59·4
Hope Fountain	74·0	58·9	77·0	60·1
Wankie—				
Victoria Falls	82·0	66·5	84·2	66·2
Wankie (Hospital)	85·6	67·0	85·0	67·2

RAINFALL.

Station	January	February
MASHONALAND—		
Charter—		
Buhera	19·65	9·51
Bushy Park	18·55	6·26
Enkeldoorn Gaol	20·28	10·69
Marshbrook	16·92	11·38
Range	18·94	9·32
Riversdale	13·98	16·06
Umniati	11·35	4·82
Vrede	15·40	17·87
Wylde Grove	13·42	13·27
Chibi—		
Chibi	15·78	5·80
Nuanetsi Ranche	8·83	15·30
Chilimanzi—		
Central Estates	16·18	6·75
Chilimanzi	15·95	9·94
Driefontein	15·22	8·16
Induna Farm	18·94	10·28

RAINFALL—*(Continued).*

Station	January	February
MASHONALAND—(Continued)		
Chilimanzi—continued		
Orton's Drift	14·78	4.45
Umvuma (Railway)	11·40	—
Darwin—		
Mount Darwin	10·94	10·36
Gutu—		
Chingombe	14·87	—
Eagle's Nest Ranche	17·84	10·50
Gokomere	20·67	10·71
Gutu	19·74	12·94
Hartley—		
Ardgowan	15·53	7·68
Auchter Leny	14·59	10·93
Battlefields (Railway)	9·18	—
Carnock Farm	17·27	8·97
Elephant Hill, Battlefields	—	—
Elvington	13·59	8·61
Gadzema (Railway)	13·02	11·46
Garthnor	—	—
Gatooma	11·98	15·41
Gatooma (Railway)	9·19	11·62
Gowerlands	14·96	11·80
Hallingbury Farm	8·02	6·80
Hartley Hospital	9·62	9·58
Hartley (Railway)	10·15	—
Hopewell	—	—
Idaho Farm	11·49	—
"Jenkinstown"	—	—
Makwiro (Railway)	12·86	—
Philiphaugh	20·46	10·56
Shagari	9·01	10·07
Spitzkop	13·78	8·95
Inyanga—		
Inyanga	19·98	19·44
Rhodes Estate	24·33	18·22
St. Trias' Hill	22·69	17·90
Lomagundi—		
Argyle	14·03	9·59
Banket Junction (Railway)	7·47	—
Darwendale	13·26	10·29
Duxbury Farm	9·03	5·92
Eldorado Mine	8·04	10·62
Eldorado (Railway)	7·62	—
Lion's Den	9·75	10·29
Lone Cow Estate	11·67	—
Longmead	10·08	10·36
Maningwa	11·94	9·83
Mikore	11·50	13·06
Mukwe River Ranche...	12·25	7·43
Palm Tree Farm	9·56	8·73
Sinoia	8·59	10·65
Sinoia (Railway)	8·11	6·02
Sipolilo	9·87	12·58
Umvukwe Ranche	13·29	—

RAINFALL—(*Continued*).

Station	January	February
Mashonaland—(Continued)		
Makoni—		
Carlow Farm	18 90	16·30
Chimbi Source	13·37	10·45
Delta	16·18	13·08
Eagle's Nest	10·77	9·61
Ellavale	17·56	—
Gorubi Springs	20·88	12·82
Headlands (Railway)	13·79	—
Mona	20·00	11·80
Monte Cassino Mission	11·27	11·93
Odzi (Railway)	20·84	12·67
Rusape (Railway)	17·19	—
Springs	12·21	9·13
York Farm	21·21	16·01
Marandellas—		
Bonongwe	16·90	10·63
Huish Estate	15·66	9·83
Kwenda Hospital	—	—
Land Settlement Farm	13·88	10·24
Macheke (Railway)	10·67	—
Marandellas	13·41	—
Marandellas (Railway)	12·84	—
Nelson	14·55	9·55
Selous Nek	12·78	10·28
Theydon	12·53	11·85
Tweedjan	17·40	13·49
Verdoy	12·14	9·07
Mazoe—		
Avonduur	12·86	8·43
Bindura	10·09	13·50
Bindura (Railway)	11·66	11·64
Ceres	11·89	11·46
Chipoli	8·57	14·34
Citrus Estate	11·01	11·68
Craigengower	13·09	9·24
Dunmaglas	9·29	10·77
Glendale (Railway)	11·05	—
Kilmer	13·34	14·35
Kingston	11·52	9·99
Laguaha	12·46	—
Lowdale	11·85	8·55
Mazoe	—	—
Mazoe (Railway)	—	—
Mguta Valley	—	—
Omeath	10·93	10·54
Protea Farm	—	—
Ruia	13·21	9·08
Ruoko Ranche	10·28	—
Shamva	13·97	12·05
,, Mine	11·71	12·53
Stanley Kop	11·36	7·67
Sunnyside	11·96	7·95
Teign	12·62	9·15
Virginia	—	9·38
Volynia Ranche	11·95	11·27

RAINFALL *(Continued)*.

Station	January	February
MASHONALAND—(Continued)		
Mrewa—		
Glen Somerset	14·54	10·82
Mrewa	10·66	14·27
Mtoko—		
Makaha	10·86	6·35
Mtoko	15·19	12·02
Melsetter—		
Brackenburg	38·24	39·97
Chikore	—	—
Chipinga	30·90	20·54
Helvetia	30·78	27·37
Melsetter	32·36	27·28
Mount Selinda	54·10	33·62
Mutambara Mission	—	—
Pasture	—	—
Tom's Hope	13·03	13·86
Vermont	32·61	—
Ndanga—		
Bikita	42·44	37·35
Chiredzi Ranche	32·97	16·17
Marah Ranche	—	—
Ndanga	30·51	—
Pamushana	31·55	—
Salisbury—		
Ardbennie	—	—
Avondale	12·60	8·06
Botanical Experiment Station	14·09	11·59
Bromley	14·69	9·00
Brookmead	—	—
Borrowdale (Hatcliffe)	14·66	11·63
Chishawasha	15·41	11·22
Cleveland Reservoir	15·80	10·03
Ewanrigg	—	—
Forest Nursery	16·51	—
Goromonzi	19·00	11·41
Gwebi	10·95	13·02
Glenara	11·72	10·99
Hillside	11·41	10·04
Lilfordia	11·29	—
Salisbury (Gaol)	—	—
,, (Railway)	12·41	9·39
Sebastopol	15·62	6·70
Selby	—	—
Stapleford	17·36	13·82
Sunnyside	9·74	—
The Meadows	16·25	11·31
Vamona	13·24	9·68
Westridge	11·85	9·77
Umtali—		
Hoboken	—	15·70
Odzani	25·51	11·81
Penhalonga	24·18	11·27
Premier Estate	13·89	5·76
Public School	17·54	12·22

RAINFALL *(Continued).*

Station	January	February
MASHONALAND—(Continued)		
Umtali—continued		
Sarum	—	—
Stralsrund	18·31	15·16
Summerfield	—	—
Umtali (Railway)	18·98	—
Utopia	25·87	9·62
Urungwe—		
Nassau Estate	10·07	12·11
Victoria—		
Brucehame	23·07	9·02
Clipsham	21·91	11·39
Empress Mine	20·13	10·59
Eythorne	20·67	11·37
Fairburn	21·54	10·32
Fort Victoria (Railway)	19·00	—
Marthadale	—	—
Makorsi River Ranche	27·73	15·90
Morgenster	31·16	—
Silver Oaks	18·96	9·65
Victoria	20·75	—
MATABELELAND :		
Belingwe—		
Tamba	14·18	1·66
Wedza	15·29	—
Bembesi (Railway)	14·38	—
Bubi—		
Imbesu Kraal	8·43	2·53
Inyati	11·01	5·01
Maxim Hill	12·86	3·62
Shangani Estates	14·60	4·07
Bulalima-Mangwe—		
Empandeni	5·54	—
Garth	12·95	2·83
Mholi (late Magot)	7·35	3·11
Plumtree School	—	—
Riverbank Farm	10·09	2·83
Solusi Mission	11·44	3·79
Syringa	4·77	7·46
The Retreat	6·79	2·84
Tjankwa	6·77	—
Tjompanie	6·13	—
Bulawayo—		
Government House	—	—
Keendale	10·45	3·83
Khami	7·54	1·91
Lower Rangemore	9·74	—
Observatory	—	—
Raylton (Railway)	9·14	—
Saw Mills	5·36	—
Umgusa	9·40	3·00
Gwanda—		
Antelope Mine	7·26	2·10
Gwanda (Gaol)	8·88	1·69

RAINFALL *(Continued)*

Station	January	February
MATABELELAND—(Continued)		
Gwanda—continued		
Gwanda (Railway)	9·22	—
Lamulas	4·49	—
Langalanga	6·97	—
Makalali	5·04	—
Manantji	4·55	—
Mapande	7·40	—
Mazunga	4·58	1·48
Mtshabzi Mission	9·85	1·89
Tuli	—	—
West Nicholson (Railway)	12·47	—
Gwelo—		
Daisyfield	15·93	6·53
Dawn	13·38	4·90
Globe and Phœnix Mine	11·17	6·29
Globe and Phœnix (Railway)	12·25	—
Gwelo (Gaol)	11·45	8·18
Gwelo (Railway)	11·77	—
Hunter's Road	10·90	10·94
Lalapanzi (Railway)	16·70	—
Lovers' Walk	—	—
Lower Gwelo	10·97	5·11
Oaklands	17·68	9·13
Rhodesdale Estate	14·51	9·98
Sikombela Farm	14·32	7·32
Woodendhove	14·82	11·08
Insiza—		
Albany	14·55	6·40
Filabusi	15·33	2·24
Fort Rixon	13·73	6·25
Infiningwe	19·46	—
Insiza (Railway)	11·38	—
Inyezi Farm	13·31	4·14
Orangevale	15·52	—
Roodeheuvel	19·12	5·35
Shangani (Railway)	10·42	—
Thornville	12·62	—
Matobo—		
Holly's Hope	10·98	—
Matopo Mission	18·76	2·59
Rhodes Matopo Park	10·00	1·77
Nyamandhlovu—		
Gwaai (Railway)	—	—
Edwaleni	5·40	4·85
Impondemi	6·38	4·90
Melinakanda Junction	8·97	—
Naseby Farm	8·60	2·68
Nyamandhlovu (Railway)	8·24	—

RAINFALL *(Continued).*

Station	January	February
MATABELELAND—(Continued)		
Sebungwe—		
Gokwe	13·26	7·69
Inyoka	16·86	7·02
Selukwe—		
Aberfoyle Ranche	19·74	8·72
Hillingdon	18·40	7·06
Selukwe (Railway)	21·68	11·73
Tokwe River Ranche	—	—
Tokwe Section	21·41	—
Umzingwane—		
Balla Balla (Railway)	14·08	—
Crombie's	15·56	1·50
Essexvale	10·19	3·21
Heany Junction (Railway)	13·43	—
Hope Fountain	17·37	3·45
Ntabenede	22·34	6·55
Springs Farm	12·42	—
Wankie—		
Dett (Railway)	7·82	—
Matetsi (Railway)	11·32	5·60
Ngamo (Railway)	6·51	—
Victoria Falls	5·70	4·07
Victoria Falls (Railway)	5·93	—
Wankie Hospital	10·41	5·63
Wankie (Railway)	13·09	—

— No return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1918		
			April	May	June
Beatrice Road	Various farmhouses	A. V. Johnson	..	..	13
Bembesi	Queen's Mine Hotel	V. C. Andrews	..	3	7
Bindura	Bindura	C. J. Glen	13	11	8
Bromley	Bromley	A. A. Draper	4	2	6
Charter—Mgezi	Beatrice Mine	W. Krienke	24	29	26
Central	Umvuma	— James	27	25	29
Eastern Border (South Melsetter)	Helvetia	J. T. Jollie	12	10	14
Enterprise	Arcturus Hotel	J. G. M. Bernard	3	1	5
Felixburg—Gutu	Felixburg	R. H. Brown	..	11	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	6	..	1
Gatooma	Gatooma	T. J. Golding	20	18	15
Gazaland	Chipinga	W. Wood	27	25	29
Greystone	Various farm houses, Shangani	M. Kerr	13	11	8
Hartley	Hartley	J. de L. Nimmo	27	25	29
Headlands	Headlands	J. M. Harvard	27	..	29
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	13	11	8
Insiza—Shangani	Shangani	T. E. Penny	..	..	..
Inyanga	Farm Cheshire	F. W. Thiel	27	25	29
Inyazura	Inyazura	A. C. Curling	17	15	19
Iron Mine Hill	Iron Mine Hill	T. Irving	13	11	8
Lalapansi	Lalapansi	N. A. Bradford	20	18	15
Lomagundi	Sinoia	A. H. Layard	20	18	15
Lydiate	Norton	W. Wrench	27	25	29
Macheke	Macheke	J. Cheyne	No fixed dates		
Makwiro	Makwiro	C. D. Voigt	19	17	21
Marandella and Mangwendi	Marandellas Farmers' Hall	A. Nicholson	6	4	1
Makoni	Rusape	J. G. Monckton	6	4	1
Makoni North	Makoni North	—— ——	27	25	29
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	3	1	5
Matopo Branch, R.L. and F.A.	Sibali	——	..	8	..
Mazoe	Glendale Siding	A. G. McCall	10	8	12
Melsetter (North)	Various farms	N. N. Rutherfurd	..	..	..
Midlands	Gwelo	A. Cox, Box 93, Gwelo	12	10	14
Northern Umtali	Farm Summerfield	R. O. H. Blurton	..	..	1
Norton and District	Norton Store	H. Grimmer	6	4	1
Que Que	Que Que	E. J. Ross	20	18	15
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	26	31	28
Shamva	Shamva	Wm. Scott	..	15	..
Selukwe	Selukwe	F. S. Clark	No fixed dates		
Somabul and Shangani Flats	Weltevrede School	G. B. Botha	..	11	..
Umvukwe	Various ranches	M. Mitton	..	11	15
Umtali	Christmas Pass Hotel	J. S. Holland	6	4	1
Victoria	Victoria	John Rennie	5	3	7
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	13	11	8

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Farm Seeds

The undermentioned seeds grown on the Government Experiment Farms are offered for sale at the prices stated. The amounts available are limited.

The prices quoted are f.o.r. Salisbury, or, when available, from the Gwebi Experiment Farm. The distribution of seed will commence from the 1st September, except in the case of Napier's fodder, which will be distributed from the 1st December only. Napier's fodder will be sold in bags containing approximately 200 roots, but no guarantee can be given of the exact number contained in each bag.

On account of the limited supply available in some cases, it is impossible to guarantee the full delivery of any order. *Farmers are therefore requested not to enclose cheques until they are advised as to the amount of seed allotted to them.* The seeds are consigned carriage forward in the case of stations. In the case of sidings the amount of railage will be notified after despatch.

All orders for seed must be addressed to the Government Agriculturist, Department of Agriculture, Salisbury.

1. Boer manna seed, 3d. per lb.
2. Buckwheat (Japanese), 10s. per 100 lbs.
3. Castor oil beans, 2d. per lb., 15s. per 100 lbs.
4. Dhal (ordinary), 2d. per lb., 15s. per 100 lbs.
5. Sudan grass seed, 2s. 6d. per lb.
6. Sunflower (black seeded), 2d. per lb., 15s. per 100 lbs.
7. Napier's fodder roots, 5s. per bag containing approximately 200 roots.

Forest Nursery—Sale of Trees

A list of the trees and shrubs available for sale, with prices, may be obtained on applying to the Assistant Agriculturist, Salisbury.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 61. Requirements in sending Botanical Specimens to the Department for Identification.
No. 62. Services of Agricultural Engineer.
No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 90. Reports on Experiments—Experimental Station, Salisbury, 1910-1911, by J. H. Hampton.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.
No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultural Engineer.
No. 177. Notes on the Raising of Seedling Trees, by F. B. Willoughby.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W. M. Watt.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 222. Costs of Farm Operations, Gwebi.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 126. Turkish Tobacco.
No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 138. Tobacco Culture (Virginia)—Harvesting and Curing.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.

No. 175. Notes on Lucerne, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch-Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 43. Citrus Psylla.
No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 140. Insect Pests of Tobacco in Southern Rhodesia, by R. W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 151. Potato Spraying Experiments for the Control of Early Blight, by Rupert W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 53. Animals Diseases Consolidation Ordinance, 1904.

No. 65. Common Ailments of the Horse, by D. R. Chatterley, M.R.C.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.
No. 180. Note on the Treatment of Biliary Fever of the Horse with Trypan Blue, by Ll. E. W. Bevan, M.R.C.V.S.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

LIVE STOCK.

No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.
No. 242. Construction of Dipping Tanks (Revised).
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 134. Plans and Specifications for Flue Curing Tobacco Barns.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 157. Hints on Brickmaking, by G. T. Dyke.
No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 199. Eucalypts for the Farm, by J. J. Boocock.

No. 205. Home Butter Making, by R. C. Simmons.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 213. **Hydraulic Rams, by W. Martin Watt.**
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 226. Classification of Clouds.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 237. The Analysis of Agricultural Products, Soils, Water, etc.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 260. Rhodesian Farm Orchard, by A. G. Turner.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 266. Directory of Farmers. (Price 1s.)
No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 275. War Settlement in Southern Rhodesia.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 282. Management of Dipping Tanks, by J. M. Sinclair, M.R.C.V.S.

Malarial Fever : How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.

Malaria : its History, Prevention and Cure, by A. M. Fleming, C.M.G., M.B., F.R.C.S. (Ed.), D.P.H. (Camb.), Medical Director.

Game Law : Summary of.

Terms for Analysis by the Department of Agriculture, of Produce, Soils, Water, etc

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HANDBOOK OF TOBACCO CULTURE for Planters in Southern Rhodesia. Sold by the Department of Agriculture. 2/6.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

L. D.—As assistant; experienced with cattle and agriculture; age 34; married; references.

F. E. O. D.—Handy man open for permanent billet on large farm, ranch or estate. Given tools and materials, will make or repair anything in wood or iron. In woodwork—furniture, buildings, implements, etc.; in metals—welding, brazing, soldering, etc., photographic cameras, scientific instruments, typewriters, sewing machines repaired; all in a day's work. Single; not eligible for present war; has done a little for the country (three medals). Used to handling men and natives. Good home and living wage wanted. Fullest particulars on request; good references. No knowledge of cattle, and very little of farming generally.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 49 of 1918.] [8th February, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notices Nos. 240 and 281 of 1917, and in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard area in lieu thereof :—

SALISBURY NATIVE DISTRICT.

(a) *Areas of Infection.*

The farms Waterfall, Hopley and Highfield.

(b) *Guard Area.*

An area comprising the following farms :—Prospect, Retreat, Bunkershill, Spreckley, Eyerston, Adair, Boutelle, Eyrecourt, Stoneridge, Odar, Reserve, Saturday Retreat, Langford, The Rest, Amalinda, Ingwe, Glen Norah, Zuvanyika, Willowvale, Lochinvar and Ardbennie Township.

No. 99 of 1918.] [15th March, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area :—

MAZOE NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Burnleigh and Bamboo Creek.

(b) *Guard Area.*

An area bounded by a line drawn from the south-east beacon of Gosforth Farm; thence along the eastern boundaries of this farm, Avonduur, Geluk, Glendale No. 46, the southern boundary of Ireniedale, the eastern boundaries of the latter and Dunmaglas, Makori and Brockley; thence along the eastern boundary of the Chiweshe and Negomo Reserves to the southern boundary of Lawley's Concession; thence following its western and northern boundaries and from its most northern beacon in a straight line to Mount Bandilombdza; thence west in a straight line to the boundary of the Lomagundi native district; thence along the boundary of this district to the boundary of this Territory; thence in a south-easterly direction along this boundary to the Mazoe River; thence up this river to its junction with the Shambara River; thence up the latter and in a straight line to Manyeu Mountain; thence in a straight line to the eastern beacon of the Msana Reserve; thence along the northern boundary of that reserve and the western boundaries of The Vale and Bonny to the Nyauri River; thence up this river to the western boundary of the Jeta Reserve, and along this to the first-named point.

No. 100 of 1918.] [15th March, 1918.

AFRICAN COAST FEVER: COMPULSORY DIPPING OF CATTLE.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 7 of the "Animals Diseases Consolidation Ordinance, 1904," to declare that, within the area defined below, on and after date of publication hereof, every owner of cattle shall cause same to be dipped in an approved dipping solution, and in a dipping tank so constructed as to permit of total immersion of cattle, at such intervals as the Chief Inspector shall direct.

Description of Area.

That portion of the Mazoe native district lying east of and including the farms Cardiff, Dandazi, Green Hill and Marston, and east of a line drawn due north from the north-east beacon of the latter to the Umfurudzi River.

No. 105 of 1918.] [22nd March, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following areas of infection in the native district of Victoria :—

(1) the Farm Riverside;
(2) the Farm Brooklands;

excluding that portion known as Longlands.

No. 97 of 1918.] [15th March, 1918.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farm Burnleigh, Mazoe district, His Honour the Administrator in Council has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to declare the following area to be actively infected with African Coast Fever for the purposes of the said Ordinance.

Description of Area.

That portion of the Mazoe native district lying east of and including the farms Cardiff, Dandazi, Green Hill and Marston, and east of a line drawn due north from the north-east beacon of the latter to the Umfurudzi River.

No. 38 of 1918.] [1st February, 1918.

COMPULSORY DIPPING OF CATTLE: BEATRICE AREA, HARTLEY AND MARANDELLAS NATIVE DISTRICTS.

IN accordance with the provisions of section 2 of the "Compulsory Dipping Ordinance, 1914," notice is hereby given that the owners resident in the area described below have by a majority of votes requested His Honour the Administrator to bring compulsory dipping of cattle into operation in the said area.

Any person desiring to lodge an objection to the bringing into operation of compulsory dipping as aforesaid shall do so on or before the 5th April, 1918.

Description of Area.

Bounded by a line drawn from the junction of the Umfuli and Doronanga Rivers, up the Umfuli River to its junction with the Marirangwe River; thence by and including the following farms :—Clare, Cupar, Kenom-

bo, Didcot, Mnaku, Nyadchidze, Lanark, Luthrie, Kimcote; thence up the Hunyani and Nyatsimi Rivers to the south-east beacon of the farm Guzha; thence by and including the following farms :—Guzha, Guildford, Nyaringondo, Carisbrook, Landen, Liege, Muda, Dunrobin, Taga, Eden, Enondo and Georgina; thence from the north-west beacon of the latter farm to the north-west beacon of the farm Orangia on the Doronanga River; thence down this river to the first-named point.

No. 63 of 1918.] [22nd February, 1918.

COMPULSORY DIPPING OF CATTLE: LOMAGUNDI NATIVE DISTRICT.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 2 of the "Compulsory Dipping Ordinance, 1914," to declare that within the area defined below, on and after the publication hereof, every owner of cattle shall cause the same to be dipped in an approved dip of standard strength at intervals not exceeding fourteen days.

Description of Area.

The Lomagundi native district, excluding the farms Rothwell Extension and Hunyani Estate.

No. 64 of 1918.] [22nd February, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 9 of the "Compulsory Dipping Ordinance, 1914," to suspend until further notice compulsory dipping of cattle, as provided for by Government Notice No. 63 of 1918, in the following area in the Lomagundi native district :—

Description of Area.

That portion of the native district of Lomagundi bounded by a line drawn from the junction of the Sanyati and Zambesi Rivers up the Sanyati River to its junction with the Tengwe River; thence up the latter to its headwaters; thence in a direct line to the headwaters of the Mlechi River; thence down the latter to its junction with the Angwa River; thence down the latter to the escarpment; thence eastwards along the escarpment to the Utete River; thence down the latter to the Msengezi River; thence down the latter to the Anglo-Portuguese border; thence westward and northward along that border to where it cuts the Zambesi River; thence up the latter to its junction with the Sanyati River.

No. 65 of 1918.] [22nd February, 1918.

COMPULSORY DIPPING OF CATTLE: SOUTH MARANDELLAS AREA.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 2 of the "Compulsory Dipping Ordinance, 1914," to declare that within the area defined below, on and after the publication hereof, every owner of cattle shall cause same to be dipped in an approved dip of standard strength at intervals not exceeding fourteen days, except during the months of June, July and August, when the intervals shall not exceed twenty-eight days.

Description of Area.

An area bounded by and including the following farms :—Lendy Estate, Stow, Shiota Reserve, unalienated land, Middlewater, Welgetroos, unalienated land, Pinhoe, Corfe, Par, Cloutsham, Espy, Bow, Dean, Liliefontein, Hopleys, Bita, Sabi, Goto, Rundi, Wedza Reserve, Wye Valley, Chiswana, Tweedjan, Nyakurwi, Elands Laagte, Somers Lust, Soshwi Native Reserve, De-ay, Boom, Tarara, Gatzi, Nolans, Lottie, Tipperary, Kingsdown and Reserve.

No. 86 of 1918.] [8th March, 1918.

COMPULSORY DIPPING OF CATTLE: GADZEMA AREA, HARTLEY DISTRICT.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 2 of the "Compulsory Dipping Ordinance, 1914," to declare that, within the area defined below, on and after the publication hereof, every owner of cattle shall cause same to be dipped in an approved dip of standard strength at intervals not exceeding seven days.

Description of Area.

An area bounded by a line drawn from the confluence of the Umsengaisi and Umfuli Rivers, up the latter to the Serui River; thence up this river to the Cape Boys' Reserve; thence along the western boundary of this reserve, the southern and western boundaries of Railway Farm No. 22, and the eastern boundary of Railway Farm No. 21 to its north-eastern beacon; thence in an easterly direction to the north-west beacon of the farm Spencer; thence in a north-easterly direction along the northern boundaries of this farm, Railway Farm No. 23, and the western boundaries of Woodsgift, Railway Farm No. 25, Southwood, Northwood and Niklot, to the most northerly beacon of the latter farm; thence following the eastern and north-western boundaries of Mowbray to the Umsengaisi River, and along this river to the first-named point.

EXPORT OF CATTLE TO THE UNION OF SOUTH AFRICA.

WITH reference to Departmental Notice of 27th September, 1917, it is hereby notified for public information that the Government of the Union of South Africa has now approved of slaughter cattle from Mashonaland being allowed to proceed by rail in sealed trucks to the abattoirs at Johannesburg and Pretoria, provided the cattle are free from ticks, and that all movements and permits are approved by the Chief Veterinary Surgeon.

The condition previously in force, that the cattle should first be detained in Matabeleland for two months immediately prior to being entrained for the Union, is withdrawn.

The Bechuanaland Protectorate authorities have expressed their willingness to allow the cattle to pass through their territory under the above conditions.

The export of cows in calf or with calves at foot is prohibited.

G. N. Fleming,
For Director of Agriculture.

Department of Agriculture,
Salisbury, 5th February, 1918.

NOTICE.

IT is hereby notified that Departmental Notice of 30th March, 1917, relating to the importation of stock from the Province of the Cape of Good Hope, is cancelled. In future all applications for importation will be dealt with under the provisions of Government Notice No. 22 of 1917.

G. N. Fleming,
For Director of Agriculture.

Department of Agriculture,
Salisbury, 5th February, 1918.

No. 39 of 1918.] [1st February, 1918.

HIS Honour the Administrator has been pleased, under the provisions of the "Nurseries Ordinance, 1909," to appoint Arthur George Turner, Esquire, to be an Inspector of Nurseries.

No. 85 of 1918.] [8th March, 1918.

POUND AT ESSEXVALE.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Bulawayo, to declare and make known that a pound has been established at Essexvale, in the magisterial district of Bulawayo, and that the said pound shall be available for the public from date hereof.

SUMMARY OF THE GAME LAWS.

Game is divided into three distinct classes, described as follows :—

(a) Birds and Small Buck.
(a) Bushbuck, Hartebeest, Impala, Lechwe, Pookoo, Roan and Sable Antelope, Sitatunga, Tsessebe, Waterbuck and Wildebeest.
(c) Royal Game, which includes Eland, Elephant, Giraffe, Gemsbok, Hippopotamus, Inyala, Koodoo, Ostrich, Rhinoceros, Springbuck and Zebra.

The shooting season for Class "A" is as follows :—

In Mashonaland :
Birds from 1st May to 30th September.
Small Buck from 1st May to 31st October.

In Matabeleland :
Birds and Small Buck from 1st May to 31st October.

To shoot in Class "A" a licence costing £1 per annum is required. This entitles holders to hunt in both Provinces during the open season.

Class "B."—The season opens on 1st July and closes on 30th November in both Provinces. The licence fee is £25 for non-residents and £5 for persons having their domicile in Southern Rhodesia. This licence entitles the holder to shoot up to 15 head, which number may be increased to a total of 25 upon payment of a further sum of £15 in the one case and £5 in the other.

Class "C."—The Administrator may, if he is satisfied that the animals are actually required for scientific purposes, grant to the holder of a game licence permission to shoot or capture any of the species included in this Class. Such permit requires a £5 stamp. Applications in writing, together with proof of *bona fides*, should be addressed to the Director of Agriculture.

Game for Farming Purposes.—Permits may be granted for the capture of Eland, Ostrich, Zebra or other animals for the purposes of breeding or farming. Such permits require a stamp of the value of £1 and remain in force for six months. Application, accompanied by a sworn declaration, should be made through the Director of Agriculture or the Civil Commissioner of the district.

Game Injuring Crops.—The occupier of any cultivated land, or any person acting under the authority of such occupier, may at any time destroy game actually doing damage on such land.

Export of Game.—No living Game or the Eggs of any Game Birds may be exported beyond the limits of Southern Rhodesia without a written permit.

Shooting on Private Land.—A licence does not entitle the holder thereof to shoot on private land without the permission of the land-owner.

Farmers Shooting Game on their Farms.—By taking out a special £1 licence, farmers may at any time shoot any game on their land. "Game" does not include any birds, except ostriches.

Open Area.—The shooting or capturing of all classes of game with the exception of ostriches and other birds classified as game is permitted within the following area in the Hartley district until further notice :—

Hartley District.—From the railway bridge on the Umfuli River, thence north-westwards along the Umfuli River to where it joins the Umniati River, thence southwards along the Umniati River to where it joins the Umsweswe River, thence eastwards along the Umsweswe River up to the drift at the Lydia Mine, thence along the old road from Lydia Mine to Etna Mine and to Inez Mine, thence northwards along the road from Inez Mine to Hartley, thence in the direction of the railway bridge to the starting point on the Umfuli River.

The game specified may be shot in this area without a licence.

Protected Area.—All game is strictly preserved in the Urungwe Game Sanctuary as defined below :—

An area in the Lomagundi district, bounded as follows : On the north and west by the River Zambesi, starting at the point where the Lozenzi River joins the Zambesi, and following the course of the latter river to its junction with the Sanyati River; on the east by an imaginary line drawn from the junction of the Indurune and the Nyaodsa Rivers to the headwaters of the Lozenzi River, and thence along the course of the Lozenzi River to its junction with the Zambesi River; on the south by an imaginary line drawn due west from the point of junction of the Indurune and Nyaodsa to the Sanyati River, thence along the course of this river to where it enters the Zambesi.

Game in Class "A" may be hunted in the close season until further notice on private land in the Melsetter district by holders of a licence.

"Locust Birds" are strictly protected, *vide* Government Notice No. 390 of 1912.

Elephants on Occupied Farms, Melsetter.—The destruction of Elephants when found on occupied farms on the High Veld in Melsetter District is authorised (*vide* Government Notice No. 284 of 1908).

Trespassing on native reserves, in pursuit of game or otherwise, is prohibited, except with the written permission of the Chief Native Commissioner.

Trypanosomiasis.—Persons in search of game in the southern part of the Sebungwe district are warned of the danger of hunting anywhere west of the Sengwe and Lutope Rivers within the fly area, and especially of proceeding anywhere within the valley of the Busi River.

There is every evidence of a very strong demand in the Union and Rhodesia for Shorthorn cattle of exclusively Scotch pedigrees, and some of the leading breeders in South Africa wish to have nothing else. Whether they are right or not is a matter for personal concern on the part of the breeder, but we know that females of the best strains have been fetching up to 1,500 guineas in Scotland and England, and are difficult to buy at reasonable prices.

We understand that Messrs. D. & D. H. Fraser, Ltd., of Wepener, are importing by the "Cluny Castle" eight animals, seven heifers and a bull, of fashionable Scotch blood, and will offer them for public sale at an early date, probably in Bloemfontein.

There are four heifers from the well-known herd of the Hon. Claud Portman, two to calve at an early date, and two maiden heifers by Edgecote Martial Law, which is the premier bull in the herd of the Edgecote Shorthorn Co. and probably in the United Kingdom to-day.

We noticed a very fine well-grown Broadhooks heifer, a family which usually cannot be bought at all, in calf to an Edgecote bull, and a young Butterfly heifer, with an attractive pedigree and outlook and a sure prize-winner. These are worth the attention of South African breeders.

They are not in show, but in breeding condition, and when we saw the "Cluny Castle" at the docks snow was falling, and the day before there were 20 degs. of frost registered in England and 35 degs. in Scotland. We felt glad they had plenty of hair as protection. [Advt.]

RHODESIA

Agricultural Journal.

ISSUED BY

The Department of Agriculture,

SALISBURY, RHODESIA.

ADVERTISEMENTS.

The Journal is issued every alternate month.

Application for advertising space should be addressed to the Editor. The rates are as follows, *per issue*:—

Position.	Whole page. £	s.	d.	Half page. £	s.	d.	Quarter page. £	s.	d.
Inner pages - -	2	0	0	1	5	0	0	15	0
Outer cover (back) -	4	0	0	—			—		
Inner covers (back and front) and page facing Contents	3	0	0	1	15	0	1	0	0

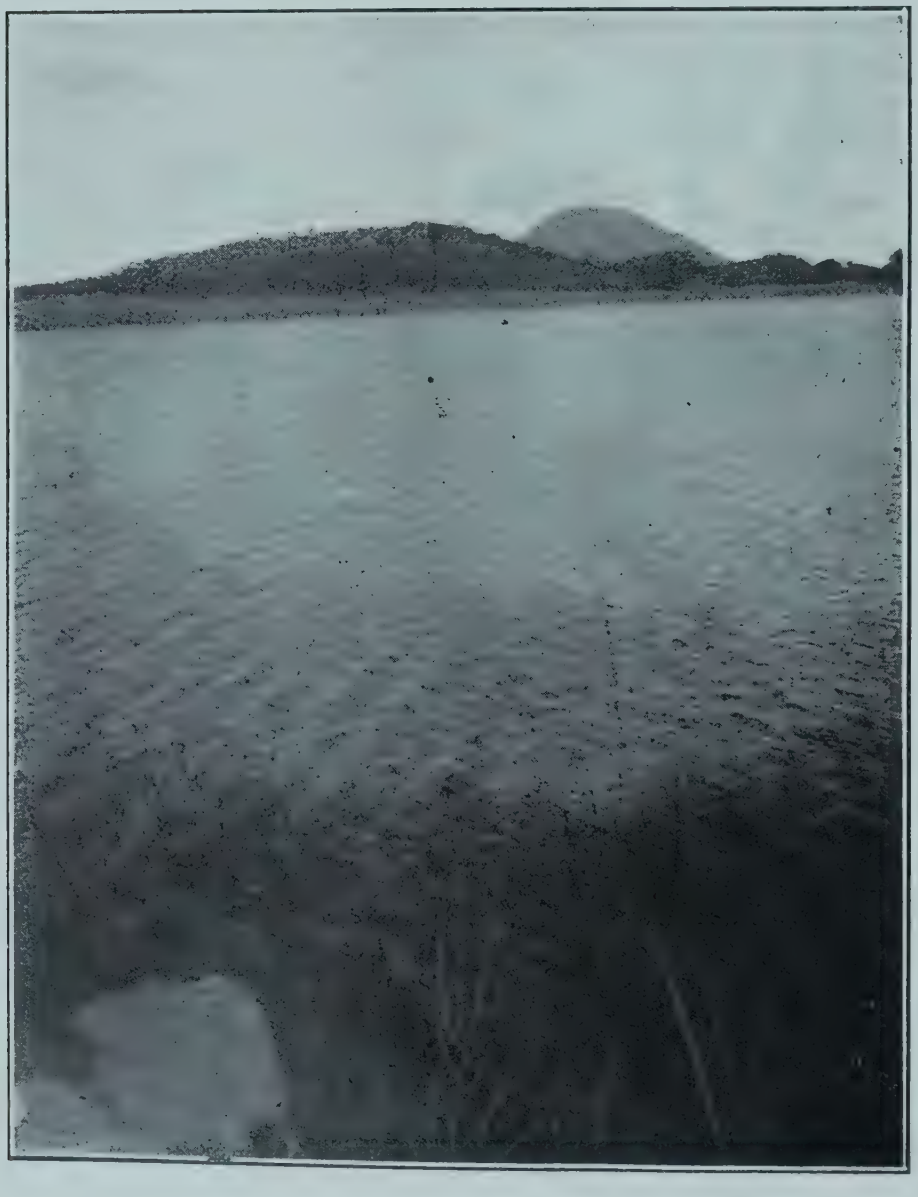
A discount of 10 per cent. will be allowed for standing or consecutive advertisements running through six issues. Remittances, and electros where desired, should accompany orders. The right is reserved to discontinue the insertion of standing or consecutive advertisements should payment beyond the second issue be delayed.

The right of approval of all advertisements by the Director of Agriculture is reserved, and his decision as to the acceptance or rejection is final.

An additional charge may be made for advertisements printed in special type, equal to any additional charges made by the printers for setting up same.

Advertisements will be accepted from *bona fide* farmers wishing to effect sale, purchase or exchange of produce, live stock or farm implements, at a minimum charge of 2/6 per insertion of 20 words. Extra words will be charged for at the rate of 1/- for every 10 words.

Dam on Mr. E. H. Mitchell's Farm, Bonisa.



Dam on Mr. G. F. Robertson's Farm, Brucehame.

THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture,
assisted by the Staff of the Agricultural Department.

PUBLISHED BI-MONTHLY.

VOL. XV.—NO. 3.] JUNE, 1918. [5s. per annum.

Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

CATTLE CLEANSING ORDINANCE.—The permissive dipping Ordinance of 1914 is now about to be replaced by a similar measure applicable to the whole country, a universal compulsory dipping law. Since the original measure was passed amid a good deal of critical doubt and suspicion, public opinion has advanced by leaps and bounds, and to-day there is a strong demand for what then was unattainable. This is a striking instance of the education of the public mind. A far-reaching measure has now been passed in accordance with the very widely expressed wish of the farming community and after repeated deliberations by the Agricultural Union. However drastic the law may be, its success must yet very largely depend upon the measure of support

accorded to it by stock owners directly concerned, for without loyal co-operation between the farmers and those charged with the administration of the law, full success will be impossible. The object in view is elimination of the tick, and thereby the eradication of tick-borne disease. Complete annihilation is impossible, for the game and other wild animals must ever remain as hosts for the tick, but practical suppression of this scourge is attainable, as has been proved by the often quoted "pressing back of the tick line" in America by systematic dipping, and when this has been realised in Rhodesia, perhaps further legislation may be brought in modifying the present arbitrary and sweeping law.

The Rhodes Estates, Matopos and Inyanga.—By means of special legislation introduced for that purpose, the estates left by Mr. Rhodes for the public benefit have been transferred from the control of his trustees to that of the Administration, on behalf of the people of Rhodesia. The proposal has long been contemplated, and is perhaps a natural outcome of conditions here, and will no doubt meet with general approval. In assuming charge of these estates, the Government takes over the responsibility of carrying out the wishes and directions of the testator, and these will be strictly observed both in the letter and the spirit. The first care is the maintenance of the grave and the hill of burial in the Matopos. The Matopos park must also be kept in order, and adorned by the planting of trees and the preservation of the natural amenities of that unique pleasure ground for the public of Bulawayo. The farms have also to be carried on. At Inyanga the development of pastoral farming both through cattle and sheep is to be continued, the orchards maintained and the timber plantations extended. Indebtedness has to be paid off and the estates put into a productive condition, a process of construction and improvement which has been going on in the past, and must continue for some years before it can be said that the properties are fully developed and adequately furnished with working capital.

As circumstances permit, the various other activities alluded to in the will are to be proceeded with, including experimental farming, market and other gardening, irrigation, teaching of these things and ultimately the establishing and maintaining of an agricultural college.

It is fitting at this time to acknowledge the work done in the past under the auspices of the trustees. Mr. J. G. McDonald, O.B.E., their representative at Bulawayo, assisted by a competent and skilled staff, and in face of many difficulties, has inaugurated and carried to their present high state of development the schemes indicated in the will.

Pounds and Trespasses Amendment Ordinance.—A difficulty in reconciling the prompt removal to a pound of animals found straying on a farm with the necessity of first obtaining a permit to do so has required special legislation to adjust. As a result, it is now obligatory

on anyone wishing to send stock to a pound without loss of time to take steps to obtain any necessary permits for movement before allowing the animals to leave the farm. This rectifies an anomaly which, though not very serious, has in the past led to some dubiety, and will set at rest any difficulties on the point in future.

Animals Diseases Amendment Ordinance.—The custom of land owners to give consent to the movement of cattle along public roads crossing their farms was recently shewn by a judicial decision to be *ultra vires*. The matter was brought to the notice of the Agricultural Union, and, after consideration at the recent Congress in Bulawayo, a resolution was carried requesting Government to restore the position in accordance with previous practice, as indicated above. To this end legislation has now been adopted whereby the procedure to which farmers generally have been accustomed will be legalised.

Locusts Destruction Ordinance.—An Ordinance to deal with locusts was sympathetically received by the Legislative Council as being a necessary measure to provide against a possible invasion by this dreaded scourge, such as has happened in the past and may any time recur. The Ordinance provides that farmers and natives occupying land shall at once notify the presence on their land of egg-laying locusts or of locusts in the hopper stage, and that they shall destroy hoppers with materials consisting of spray pumps, arsenite of soda and sugar, supplied, when required for the purpose, free by the Government. These proposals are merely an adaptation of laws which in the Union have been found effective for the purpose during the serious invasions of locusts during the past two years. Whilst it is to be hoped there may never be need to make use of this new law, it is well to know that the machinery exists should it be required, and farmers should not forget the important duty now imposed upon them of reporting the appearance of locusts.

Veld Fires.—The very rank growth of grass, owing to the recent wet season, renders the danger of veld fires specially great during the coming months, and farmers are warned of the need of special precautions against this risk. The Herbage Preservation Ordinance provides preventive measures, and particularly requires farmers to give notice to their neighbours of their intention to burn their veld, and imposes penalties for certain offences with which it would be well for farmers, transport riders and prospectors to familiarise themselves. Steps have been taken to remind natives of their obligations in this connection, and co-operation, through the Native Commissioners, between the farmers and the natives in their vicinity is earnestly to be desired.

Stitching of Maize Bags.—We are informed that the stitching up of the bags of last season's maize for export left much to be desired, so that a certain amount of loss and some delay occurred through this cause. We bring this matter to the notice of farmers now, so that they may give special attention to the question of stitching when shelling and bagging their grain this year. The point is of considerable importance when grain has to be handled several times, as is the case when it is exported, and graders will be instructed to pay attention to the point in the coming season.

Fruit and Forest Trees at Inyanga.—On another page will be found a report by Mr. J. W. Barnes, of Rhodes Inyanga Estate, in which he gives the results of his observations and experience for a period extending over six years. These are of great interest, and should be of value to settlers in other parts of what may be called the highlands of Rhodesia. The fruit industry of Inyanga promises to develop into a business of considerable importance, and a fair variety of useful timbers can be grown there. At the same time it must be recognised that conclusions drawn from experience in Inyanga can have only a limited application, for the conditions of that district are somewhat exceptional. The estate lies at a very high altitude, the winters are severe and prolonged, light rains are characteristic rather than the concentrated, tropical rainfall of other parts of the country. It is these very conditions of cold winters and frequent mists that are so favourable to the growth of special trees, such as apples and wattles, which thrive better at Inyanga than elsewhere in Rhodesia.

Appointment of Engineer.—Mr. A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E., has been appointed to fill temporarily the position of Agricultural Engineer in the Agricultural Department, in place of the late Mr. W. M. Watt. Mr. Jennings has recently returned from East Africa, where he served as sectional officer with a field engineer corps engaged principally on water supply work. Previous to going on active service, Mr. Jennings was for some years resident engineer on several irrigation schemes in South Africa, and has also had experience of engineering work in that paradise of irrigation, Egypt.

Agricultural Chemist.—A vacancy in the staff of the Department of Agriculture has been filled by the appointment of Mr. E. V. Flack to the post of Assistant Chemist. Mr. Flack has served in various capacities in the Government laboratories, Capetown, for nineteen years, and during the past nine years has filled the post of analyst under the Fertilisers and Farm Foods Act. There is much room for chemical research in connection with cultural and pastoral problems in Rhodesia. This work has suffered along with other departmental

undertakings through the war, and it is satisfactory once again to be able to undertake analyses for farmers, and to resume investigations of the many subjects which require chemistry for their elucidation.

Separation of Agricultural and Veterinary Departments.—It is announced for public information, with effect from 1st June, the Veterinary Department will be separated from the Agricultural Department.

Our Contents.—In this issue of the *Journal* there are several articles which seem to us specially valuable, and we hope they will be read with interest. Sir Arnold Theiler's paper on Contagious Abortion is a most important contribution to our knowledge of this subject, and we are indebted to the courtesy of the Union Department of Agriculture for permission to reproduce it. Mr. Jack's article, the first part of which is printed, represents the results of several years' work on a subject of great importance, and we think will be appreciated by the farmers as well as by the scientific world. We also publish a second paper of the series designed to be helpful to new settlers, by Mr. R. C. Simmons, the subject being the raising of sheep for mutton in a scheme of mixed farming. In this issue there also appear extracts from the annual report of the Director of Agriculture, which will be continued in August, together with the annual report of the Chief Veterinary Surgeon. The yearly census of live stock is printed in tabular form and with elucidatory comments.

Correction.

In our notes on the Agricultural Union Congress, which appeared in the April *Journal*, there is an error on page 152. It is there stated that "a resolution was passed which would have the effect of altering the constitution of the R.N.L. Bureau in favour of the farmers." This should have read that the "resolution was put and *lost*." Further, in reference to the resolution proposing that the subsidy to the Bureau should be made contingent upon an increase of farmers' representation upon the board, it was not made clear that the consent of Congress to bring in such a resolution was asked, but *refused*, so that it fell to the ground.

Statistics of Live Stock and Animal Produce

FOR THE YEAR 1917.

By Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture,
and F. Eyles, F.L.S., Statistician.

The census of our cattle is taken as at 31st December in each year, and the figures given below represent the returns at that date furnished by the individual owners or their representatives directly concerned on the spot, and may therefore be taken to be as accurate and complete as it is possible to obtain. The response to the call for information this year was very gratifying and full, and it is obvious that the object of the collection of the figures annually is now well understood and appreciated, and that the co-operation of all concerned is assured. We have grounds to believe that the figures on which our agricultural statistics are based become more comprehensive and correct year by year, and now approach a very high degree of accuracy.

The grand total of horned cattle in Southern Rhodesia, including those belonging to Europeans and natives, for the first time in our history reaches and passes the million, amounting together to 1,083,543. Except where specifically stated to the contrary, the figures given below refer to European-owned cattle only. The accompanying map shews at a glance the general distribution of European-owned cattle throughout the Territory by means of 1,064 dots, each one of which represents 500 head.

Cattle.—The total of European-owned cattle has advanced during the year from 468,504 to 532,311, or 63,807 head, an increase of 13.62 per cent., as against an increase of 18.6 per cent. in the previous year. This lowered rate of increase is attributable to diminished purchase from native sources, and to considerable export to the south for consumption amounting to 13,221 head. It is also in some measure due to mortality from quarter-evil and coast fever, the former being responsible for 1,335 and the latter for 438 recorded deaths; but in no way was it due to reduction of the birth rate, which was quite up to the average.

The native-owned cattle now number 551,632, or rather more than the number in the possession of Europeans. During the year the system by which this total is arrived at has been revised and improved, and in many districts is now the result of an actual count, not a mere

estimate. This is an incidental benefit of the practice of dipping which has been so largely and successfully introduced of late amongst the natives. In some districts only estimates in round numbers can still be furnished, and these err, it is believed, on the conservative side, though to no very material extent. The percentage increase on the total is a fair index of the accuracy of the enumeration; that for native stock is 12.22, as compared with 13.62 for European-owned stock, and cannot be very far wrong.

A striking feature of the returns in the accompanying schedule is the high proportion of female to male stock, over 60 per cent. being cows and heifers. This is probably due to several different causes. One is the comparatively recent commencement of many ranches, for which cows were bought from the natives or imported from the south, and in which all ages and classes are not as yet proportionately represented. The same influence, to a less degree, is no doubt true of most farms of recent date, as well as the large ranches. The exportation of oxen also adds to this predominance of females. The combination of factors, resulting in three-fifths of the total cattle being females, augurs well for a continued high rate of increase of our cattle for some time to come.

The number of draught oxen shews an increase of 4,661, which is to be expected, in view of the known increase of acreage under cultivation and the demand for transport cattle for the asbestos and other mines remote from the railway. It should also be noted that the increase of trained oxen is set off by a decrease of other draught animals, *i.e.*, mules and donkeys. The number of untrained oxen is larger by 15,353 than in the year before, shewing that the exportation of cattle is not keeping pace with the production of even unworked bullocks, let alone of both these and fattened trek oxen.

A remarkable feature brought out by the returns received is the high proportion of bulls other than stud bulls, that is, of those not in actual use for breeding purposes. There are 52,898 of the former to 6,550 of the latter. The figure, of course, includes calves and young bulls coming on, but still seems to indicate an unduly large proportion not altered. The returns under this heading will be seen to be high from all districts, averaging in most districts eight "other bulls" to one stud bull. The number of bulls is one-quarter of the entire male bovine population—52,898 out of 210,804. The corresponding figures for the previous year were in the same proportion—45,773 out of 183,205 head. Cattle exported amounted to less than one-eleventh of our total oxen. It seems to indicate that castration takes place at a comparatively high age instead of as early as possible, a habit surviving from native custom, and the practice of those who desired to breed mainly for purposes of draught instead of, as is now becoming the rule, mainly for beef.

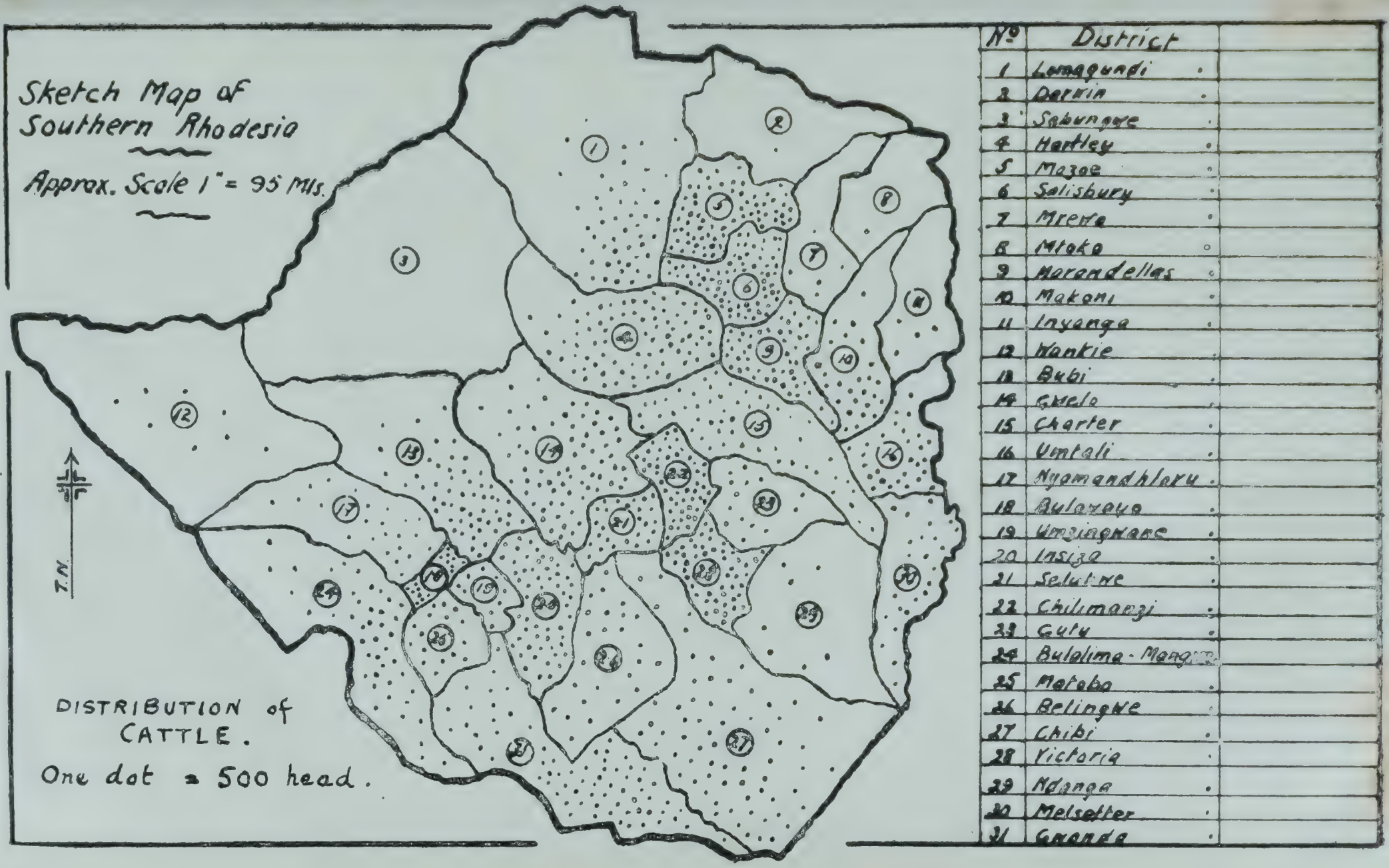
The relative position of districts in regard to the numbers of cattle in them has changed considerably since last year, Hartley coming from second place to first place, whilst in general a tendency is noted towards more even distribution. Seven districts possess upwards of 30,000 head, other seven districts boast over 20,000, whilst seven more

districts have between 10,000 and 20,000 head, and again seven districts carry between 1,000 and 10,000, and, as last year, two, and the same two, have fewer than 1,000 head. Movements on a large scale between districts have evidently taken place, accounted for probably by the inauguration of new ranching undertakings.

The number of pure-bred cattle returned is 5,497, as against 5,274 last year. The figure is somewhat arbitrary, as the question of purity is, of course, rather a vague term, and some little latitude no doubt exists. Obviously all animals included are not registered in the stud book of the respective breed to which they are accredited. On the other hand, it may fairly be assumed that the stock described as pure-bred, which form only about one per cent. of the total European-owned cattle, belong to the breeds mentioned, though not all equally high-class or pedigree stock. Of this total, bulls in use number 1,780 and other bulls 564, whilst cows number 2,581 and heifers 572. This large proportion of female stock indicates that serious efforts are being made to meet the need of locally-bred bulls, a most legitimate and praiseworthy endeavour. It will no doubt always be necessary to import the best, and to look to the British Isles, the stud farm of the world, for maintaining and improving the quality of our cattle. It is apparent that the breeders of this country are so doing, as is proved by the figures for importations.

The leading place in point of numbers is held by the Africander breed, a large number of which were imported in 1916. The total of 1,803 compares with 1,804 for the previous year, and of these 1,091 are in the Bulalima district alone and 403 are in Gwanda, leaving relatively few elsewhere. In this case, no doubt, the type, rather than pedigreed stock, has been referred to in the returns received. In a number of cases Africander bulls have been brought in where it has been thought that the stock were becoming too refined for the veld, and hardiness, even at the cost of early maturity and productiveness, was desired.

Shorthorns come next, and are first of all European breeds in point of numbers, being followed by Devons, which displace Frieslands, which are followed by Herefords, and, after considerable interval, by Angus and Sussex, after which, in order, but in small numbers, we find the South Devon, Ayrshire, Red Poll and Jersey breeds. Shorthorns, which include the Lincoln Reds, have not increased very much, being 1,298 as against 1,266 last year. Devons have risen from 477 to 678, the largest increase of any breed during the year. The Friesland, with 602, shews a serious drop of 331 from the previous year, an apparent disaster, but to be explained by a corresponding rise the previous year. This can be attributed to importation in 1916, then described as pure Friesland, which inflated the figures unduly, but which is now recognised to be grade stock, thus correcting the erroneous impression of last year. Herefords, with 532, shew a useful increase from 384 before. Aberdeen Angus, with 207, have more than doubled their numbers in twelve months, considerable importation having taken place, whilst they are closely followed by 195 Sussex, an increase from 155. The South Devon breed shews a diminution from 110 to 79,



No	District	
1	Lomagundi	.
2	Darwin	.
3	Sabungare	.
4	Hartley	.
5	Mazoe	.
6	Salisbury	.
7	Mrewa	.
8	Mtoko	.
9	Marandellas	.
10	Makoni	.
11	Inyanga	.
12	Wankie	.
13	Bubi	.
14	Gwelo	.
15	Charter	.
16	Umtali	.
17	Nyamandhlaru	.
18	Bulawayo	.
19	Umzingwane	.
20	Insiza	.
21	Selukwe	.
22	Chilimanzi	.
23	Gutu	.
24	Bulalima-Mang	.
25	Matobo	.
26	Belingwe	.
27	Chibi	.
28	Victoria	.
29	Ndanga	.
30	Melsetter	.
31	Gwanda	.

Ayrshires a small increase from 41 to 57, Red Polls are given at 35, and Jerseys come last with only six head.

Dipping Tanks.—The cattle dipping tanks in the country have increased from 761 to 991, a difference of no less than 230, or over 30 per cent. in one year. This is an eloquent proof of the sincerity and earnestness of the cattle owners in their efforts to bring about universal compulsory dipping, and makes it plain that the provision of a dipping tank on every farm is now generally accepted as a necessary part of the ordinary equipment.

The total of 991 includes 43 tanks on native reserves and 29 Government and public tanks. If the 43 native tanks are deducted, we find that 2,222 farms occupied by Europeans have at their disposal 948 dipping tanks, equal to one tank for every $2\frac{1}{3}$ farms, or nearly a tank for every two farms. Considering, however, that in many cases two or more farms are worked together as one concern, it may be fairer to take the number of farmers, approximately 1,682, when we find that each tank, on the average, serves less than two farmers. The public tanks and many privately-owned ones are known to tbe used by quite a number of farmers, so that the evidence at our disposal seems to indicate that the number of cattle owners not dipping is very small.

Live Stock in General.—As regards live stock in general, it is noticeable that, with the exception of cattle, which have increased considerably, and of sheep, which shew an increase of 4.4 per cent., the numbers of all other stock are practically stationary, or have slightly decreased. The figures are:—

	1916.	1917.	Difference.
Cattle	468,504	532,311	+63,807
Horses	1,673	1,669	− 4
Mules	2,653	2,182	− 471
Donkeys	9,836	9,605	− 231
Sheep	62,371	65,117	+ 2,746
Goats	30,189	28,299	− 1,890
Pigs	22,974	18,879	− 4,095
Poultry	101,141	101,592	+ 451

The high price of mules created by the war has no doubt led to their sale and replacement, where possible, by oxen. The diminution in horses is attributed to horse-sickness and consequent discouragement of their use, whilst the very wet season may account for the fall in donkeys. The position of horses, mules and donkeys and small stock is also probably in part attributable to the absence of so many owners. Equines require close personal care, and are a responsibility not readily transferred to a neighbour, while sheep and goats are frequently only treated as side lines, which a farmer, leaving for the front, would be likely to sell off rather than ask a friend, who takes charge of his cattle, to look after during his absence. Recovery in this line may be expected after the war.

The decrease of pigs, amounting to over 4,000, or nearly 8 per cent., is to be regretted, especially in view of the recent establishment of a

second bacon factory. This reduction is attributable in part to the high price of maize, in part to the idea, which has become widespread, that the prices obtainable were no longer remunerative, and in part to the excessively wet season, which was unfavourable to litters. The breeding of pigs was undoubtedly lessened, and the enhanced local price and high values paid in the south latterly led to a ready sale of any fairly fat pigs, leaving the total number at the end of the season much depleted.

Animal Products.—Corresponding with the decrease in most small stock, we find that all animal products, except cream, have been sold in smaller quantities during 1917 than during 1916. The figures are:—

	1916.	1917.	Difference.
Eggs, dozs.	141,580	135,895	– 5,685
Cream, lbs.	335,793	367,240	+ 31,447
Milk, lbs.	2,976,630	2,464,016	–512,614
Butter, lbs.	221,965	204,886	– 17,079
Wool, lbs.	35,309	20,824	– 14,485

Export being so restricted, and the population of the town and industrial centres stationary, farmers' trade in dairy and poultry products naturally stands still. The reduction of wool corresponds with a reduction in merinos, and is accentuated by the heavy rains which partially washed the wool before it was shorn, and rendered it lighter than usual by the removal of much yolk dirt and foreign matter. Merinos only number one-sixth of our total sheep, the majority being cross-bred from native, Africander, Persian, a few woolled Persian and a very small sprinkling of British mutton breeds.

Occupied Farms.—The number of occupied farms, as nearly as can be ascertained, is 2,222, against 2,178 for the previous year, an increase of 44. In the same period the number of resident farmers has decreased by about 75, a difference probably accounted for by the absence of many farmers either fighting at the front or doing other war work. It is a remarkable tribute to the energy and patriotism of the men left on the land that, in spite of the considerable reduction in their number, there should be an appreciable increase in the area occupied, and a very substantial addition to the acreage placed under cultivation.

We further have record of 52 small plots occupied and worked by small holders. It is probable that this figure is considerably below the correct total, and we would welcome assistance from the various town and village authorities, and from plot owners themselves, to enable us to compile records as complete as possible of all agricultural activities, particularly with regard to the cattle and orchards owned by small holders in the neighbourhood of the chief centres of population.

Cutworms.

By Rupert W. Jack, F.E.S., Government Entomologist.

Part 1.

It would be a difficult matter to estimate the average total amount of loss to agriculture in Southern Rhodesia each season through the agency of cutworms. Whilst the stalk borer is probably responsible for a considerably heavier loss to the maize crop in the aggregate, its activities are confined to this crop and its allies. Cutworms, on the other hand, are as much a pest to the tobacco planter, the potato grower and the market gardener as they are to the maize grower, and it is probable that they constitute on the whole the most destructive plant pest that vexes this Territory.

How to Recognise.—A cutworm is a smooth caterpillar, the larva of an inconspicuous night-flying moth. The Rhodesian species are, with one unimportant exception, dull grey in colour, and the largest do not exceed an inch and three quarters in length. The commonest species hardly exceeds an inch and a half. They are injurious from less than half an inch in length on young tobacco and other seedlings, but those injuring maize will be found chiefly from three-quarters of an inch to full size. Apart from inexcusable confusion between these pests and the maize borer, there are two other kinds of injurious insects which may be, and commonly are, mistaken for cutworms. These are "white grubs" and "wireworms."

"White grubs," a name which originated in the United States of America, are the young of various species of chafer beetles, some species of which are very injurious in the adult stage to foliage of fruit trees, grape vines, rose bushes, etc., in the early spring. The grubs themselves are soft, dirty white in colour, and are furnished with three pairs of comparatively long legs in the fore part of the body. The larger specimens attain a length of about an inch and a half, and are so strongly curved as to be unable to straighten their bodies. They live in the soil, and feed upon the roots of plants. They are sometimes injurious to maize, small cereals and grasses. A specimen is shewn on Plate II. at Fig. 2.

"Wireworms" is the name generally applied in other parts of the world to the young of "click" beetles (*Elateridæ*), but this particular family is not known to be injurious in Southern Rhodesia. The insects going under this name in this Territory are the young of various

species of the family *Tenebrionidæ*, the most familiar members of which are the "tok-tokje" beetles (*Psammodes spp.*). They are slender grubs with a hard, smooth, shiny skin, varying in colour from nearly white to pale yellowish brown. They live in the ground, and feed upon the underground portions of plants, being particularly injurious to tobacco. A specimen is figured at Fig. 3 on Plate II.

Cutworms may be distinguished from either of the preceding by the fact that, in addition to six true legs in the fore part of the body, as in the beetle grubs, they bear four pairs of abdominal feet further back and a pair of claspers at the end of the body (see Plate II., Fig. 1).

Rhodesian Species of Cutworms.—Four species of cutworms have been recorded in the Territory, and of these only two species are of real importance. The four species are:—(1) *Euxoa segetis*, Schiff, (2) *E. longidentifera*, Hmpsn., (3) *E. spinifera*, Hubn., (4) *Agrotis ypsilon*, Roths.

(1) *Euxoa segetis.*—This is the commonest species. It occurs throughout the greater part of the old world, and is injurious in Europe. In the British Isles it goes under the name of the "Turnip Dart Moth."

The adult moth has the fore-wings brown and the hind-wings pearly white. The female is darker than the male. Both sexes are figured life size on Plate I., Figs. 1 and 2, so that further description is unnecessary.

The *caterpillars* of this species attain a length of slightly over one and a half inches. They vary somewhat in colour, but are mostly more or less uniform dull grey or lead coloured. There is frequently a suggestion of a slightly reddish broad median dorsal stripe. The larger caterpillars may, however, be most readily distinguished from those of the other Rhodesian species by the fact that under an ordinary lens, magnifying ten diameters, the skin appears to be quite smooth, whilst in the other three species it is distinctly granular.

(2) *Euxoa longidentifera*, Hmpsn.—This is a purely African species, if we include Madagascar. As a pest, its record up to the present is a mild one. It has been bred out from batches of cutworms obtained from infested ground, but always in company with *segetis*. It has never comprised more than 10 per cent. of the total number of specimens taken.

The adult moth averages slightly smaller than *segetis*, and is very similar in appearance, the most conspicuous distinction being in the shape of the inner of the two spots on the fore-wing (known to entomologists as the orbicular stigma). In *segetis* this is approximately circular, whilst in *longidentifera* it is shaped something like a lacrosse racquet. The next species has this mark of the same shape, but is easily distinguished by its colour. Both sexes are shewn at Figs. 3 and 4 on Plate I.

The caterpillar is much the same size as that of *segetis*, but has a slightly browner and less greasy appearance. The suggestion of a

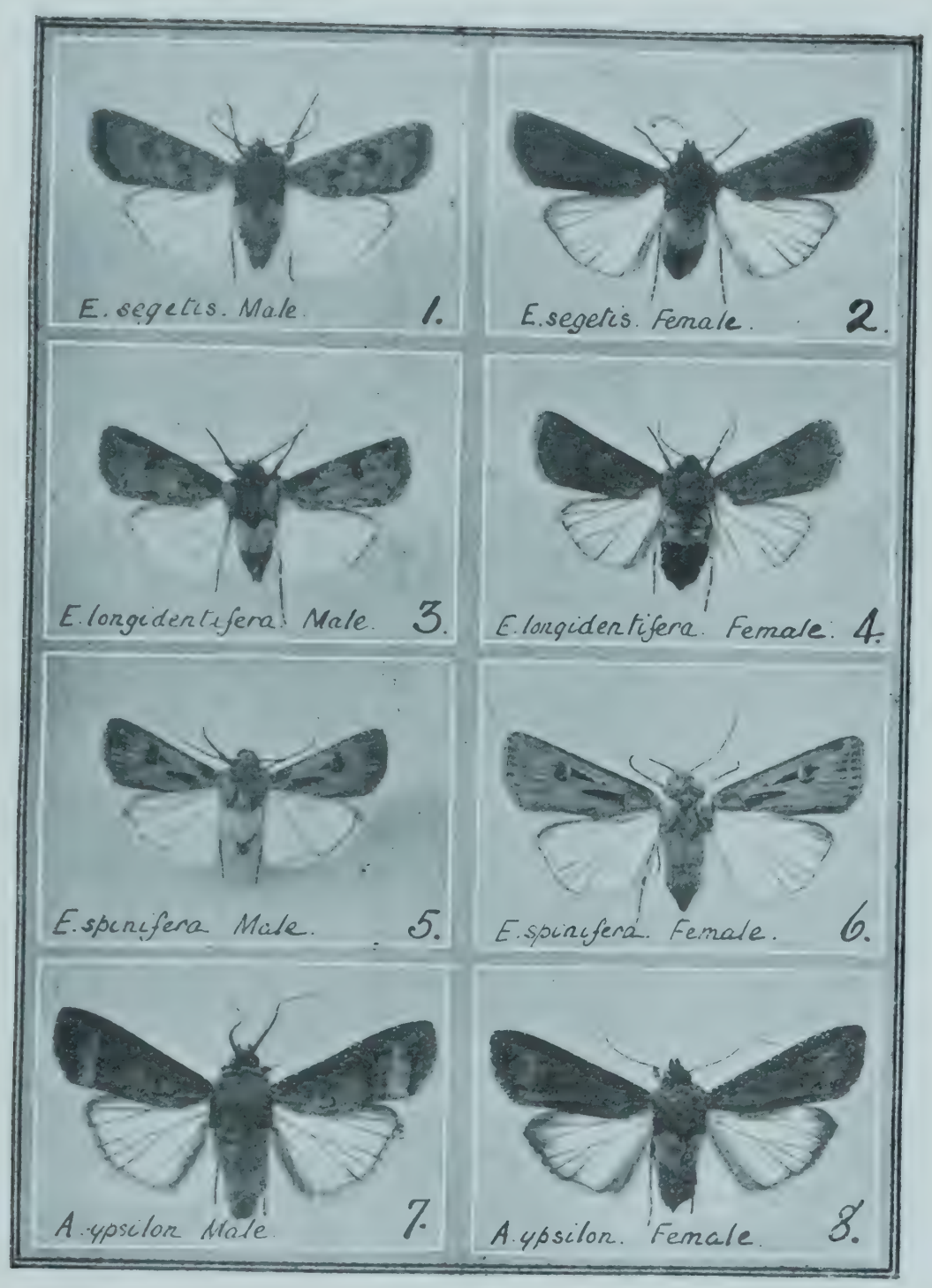

E. segetis. Male. 1.
E. segetis. Female. 2.
E. longidentifera. Male. 3.
E. longidentifera. Female. 4.
E. spinifera. Male. 5.
E. spinifera. Female. 6.
A. ypsilon. Male. 7.
A. ypsilon. Female. 8.

Plate I.

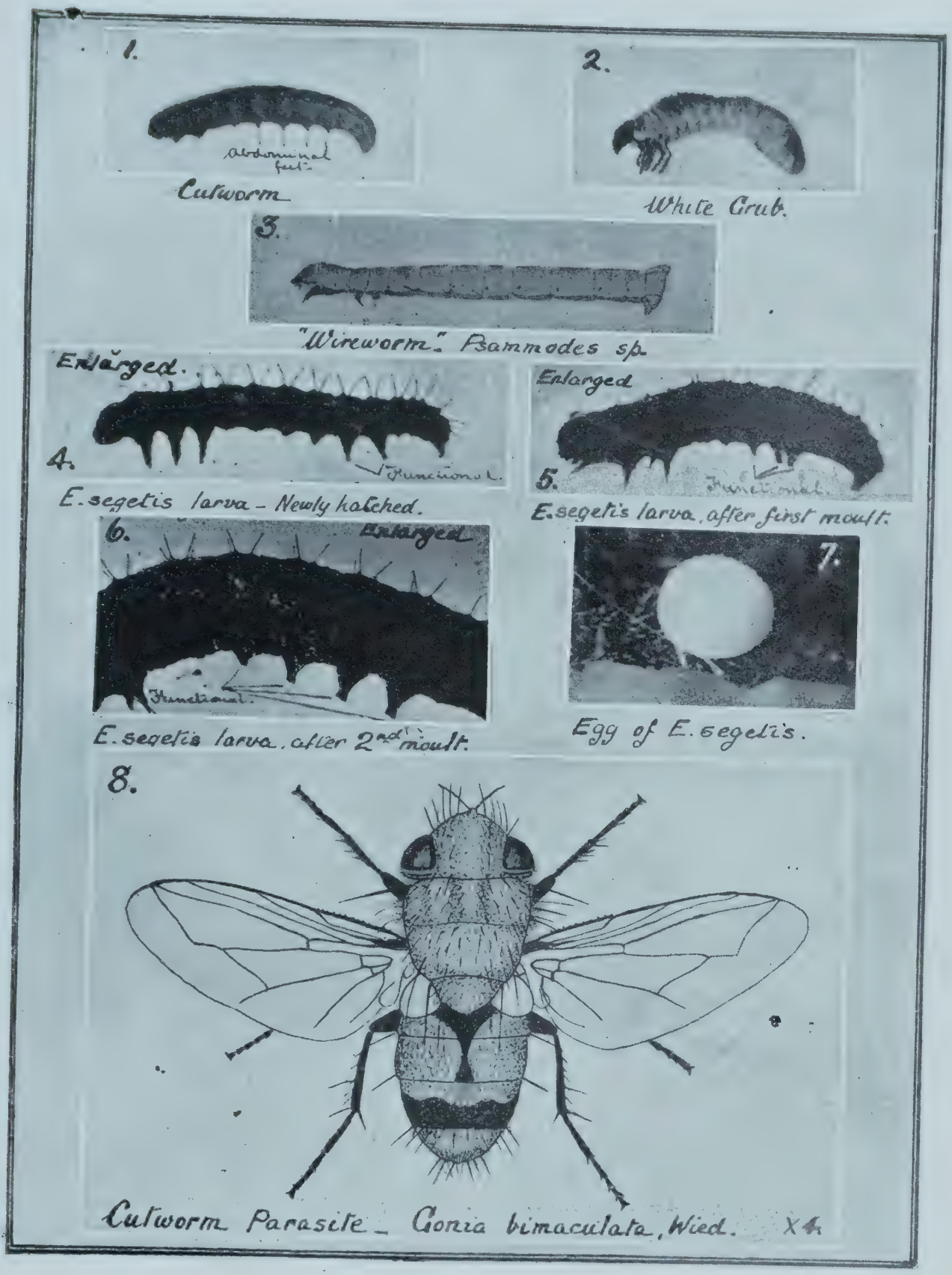

1.
Abdominal feet
Cutworm
2.
White Grub.
3.
"Wireworm." Bammodes sp.
Enlarged.
4.
Functional.
E. segetis larva - Newly hatched.
Enlarged
5.
Functional
E. segetis larva, after first moult.
6.
Enlarged
Functional.
E. segetis larva, after 2nd moult.
7.
Egg of E. segetis.
8.
Cutworm Parasite - Gonia bimaculata, Wied. X4.

Plate II.

reddish median stripe down the back is commonly more pronounced. From *spinifera* the larva may be distinguished by the fact that the setiferous plate or tubercle, which lies immediately behind the spiracle on most of the segments, is very much larger than the spiracle itself, whereas in *spinifera* this plate approximates to the same size as the spiracle. It is, however, a much more difficult matter to distinguish the larva from that of *ypsilon*, especially with preserved specimens. Beyond the fact that *ypsilon* larvæ are *usually* darker in colour, greasier in appearance, rather more deeply constricted between the segments, and more strongly punctate or rugose about the head, there is nothing to distinguish them. With the exception of the last, all these differences are much obscured in preserved specimens, and even the roughness of the head is not a sure guide, as there is a certain amount of variation. Anyone familiar with the two species, however, would rarely confuse living specimens, especially those of the last instar.

(3) *Euxoa spinifera*, Hubn.—This species extends from Southern Europe to the Cape and India. It can hardly be called a pest in Southern Rhodesia, but is occasionally bred out from batches of cutworms consisting mainly of *segetis*.

The *adult moth* is greyer in colour than any of the other species, and is readily recognised on this account. Both sexes are figured on Plate I., Figs. 5 and 6.

The comparatively few *caterpillars* which the writer has examined were of a slightly pinkish hue, and so were easily picked out amongst the other species present. The small size of the setiferous plates round the spiracles is a distinguishing feature. These plates are sometimes concolorous with the integument, and so are difficult to see, whilst they are always conspicuous in the other three species.

(4) *Agrotis ypsilon*, Roths.—This is the only rival to *segetis* in destructiveness in this Territory. It sometimes occurs in overwhelming numbers, but is curiously sporadic in its outbreaks. It is nearly cosmopolitan in its range, inhabiting the new world as well as the old. In the United States of America it is known as the "greasy cutworm," but *segetis* is quite as greasy in appearance. In India it is reported to be the dominant species, being far more injurious than *segetis*, which also occurs there.

The *adult moth* is quite distinct in its markings from any of the other species, as may be seen by a glance at Figs. 7 and 8 on Plate I. The coloration is, however, similar to that of *segetis*.

The *caterpillar* is the largest of our native cutworms, reaching a length of an inch and three-quarters. The distinction between this and the other three species has already been dealt with. The *ypsilon* larva is on the whole a more loosely or "rangily" built caterpillar than any of the others, but the younger instars especially are hardly distinct from those of *longidentifera*.

Habits and Life-History.—Cutworm moths are of nocturnal habits, lying hidden in sheltered places during the day. They are

greedy feeders on the honey of flowers and other sweet liquids, such as the "honey-dew" secreted by plant lice and scale insects, the juice of over-ripe broken fruit, etc. They are not particularly attracted by light, though they occasionally enter lighted rooms after dark. The females begin to lay about four days after emergence. The eggs are laid in great numbers amongst suitable low-growing vegetation. They are attached to the stems of the plants, to stones, lumps of earth, sticks, tree trunks or to any other stable object. A single *segetis* female laid as many as 1,766 eggs in confinement, a figure that should give some idea of how such immense numbers of cutworms commonly appear suddenly in favourable situations. An egg of *segetis* is shewn, much enlarged, at Fig. 7 on Plate II. The eggs hatch in from five to eight days in warm weather.

The newly hatched cutworm has only two of the normal four abdominal feet functional, and moves with a looping gait. After its first moult, three pairs are functional, and it is not until after the second moult that it attains the full complement (see Figs. 4, 5 and 6 on Plate II.). The moults of a considerable number of specimens have been observed in the laboratory, and in each case the total number has been six, including the final moult immediately before pupation. There are thus six stages, or instars, of the larva. The following table has been found useful by the writer for determining the instar of any particular specimen of *E. segetis* larva. The table also applies approximately to the other species, the only difference being in the measurements, which differ to a small extent.

DIAGRAM

OF YOUNG TOBACCO PLANT

ILLUSTRATING DAMAGE DONE BY VARIOUS PESTS.

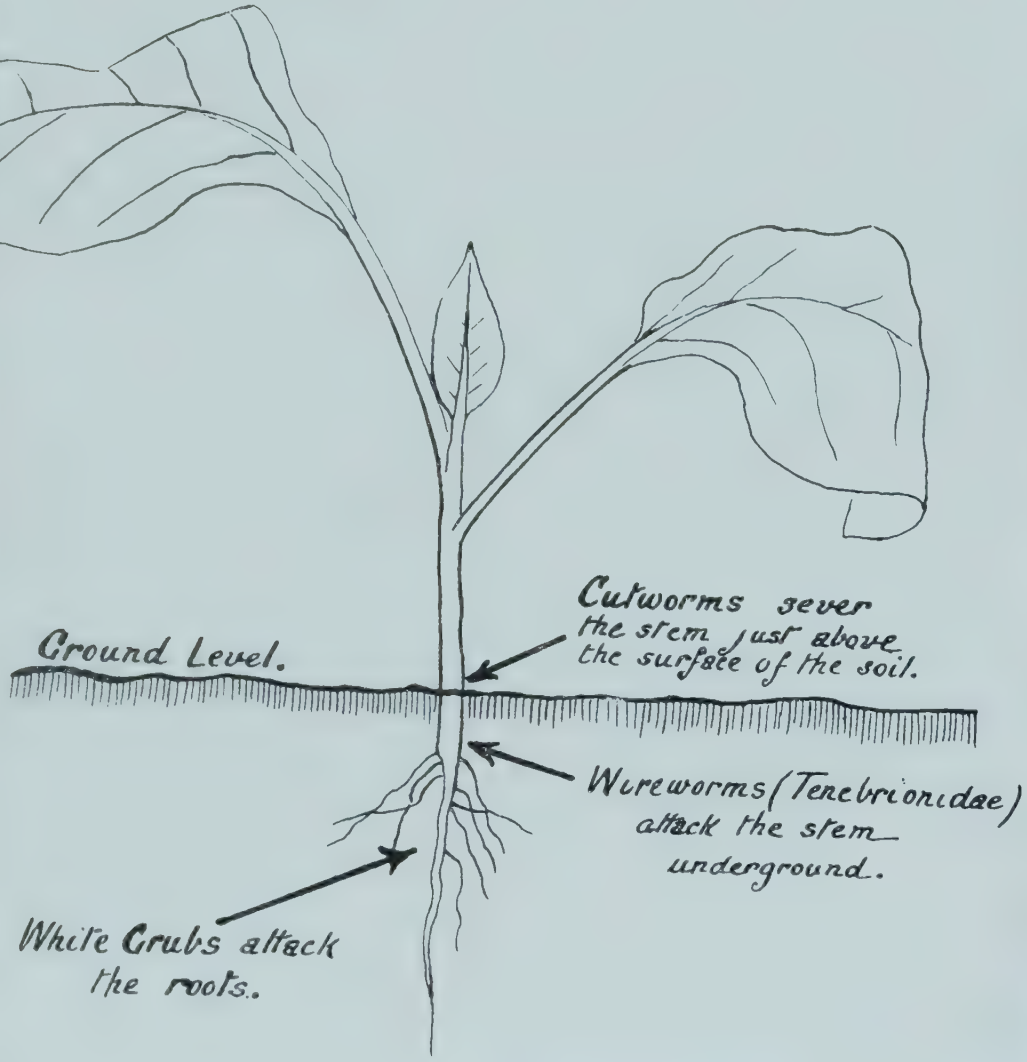
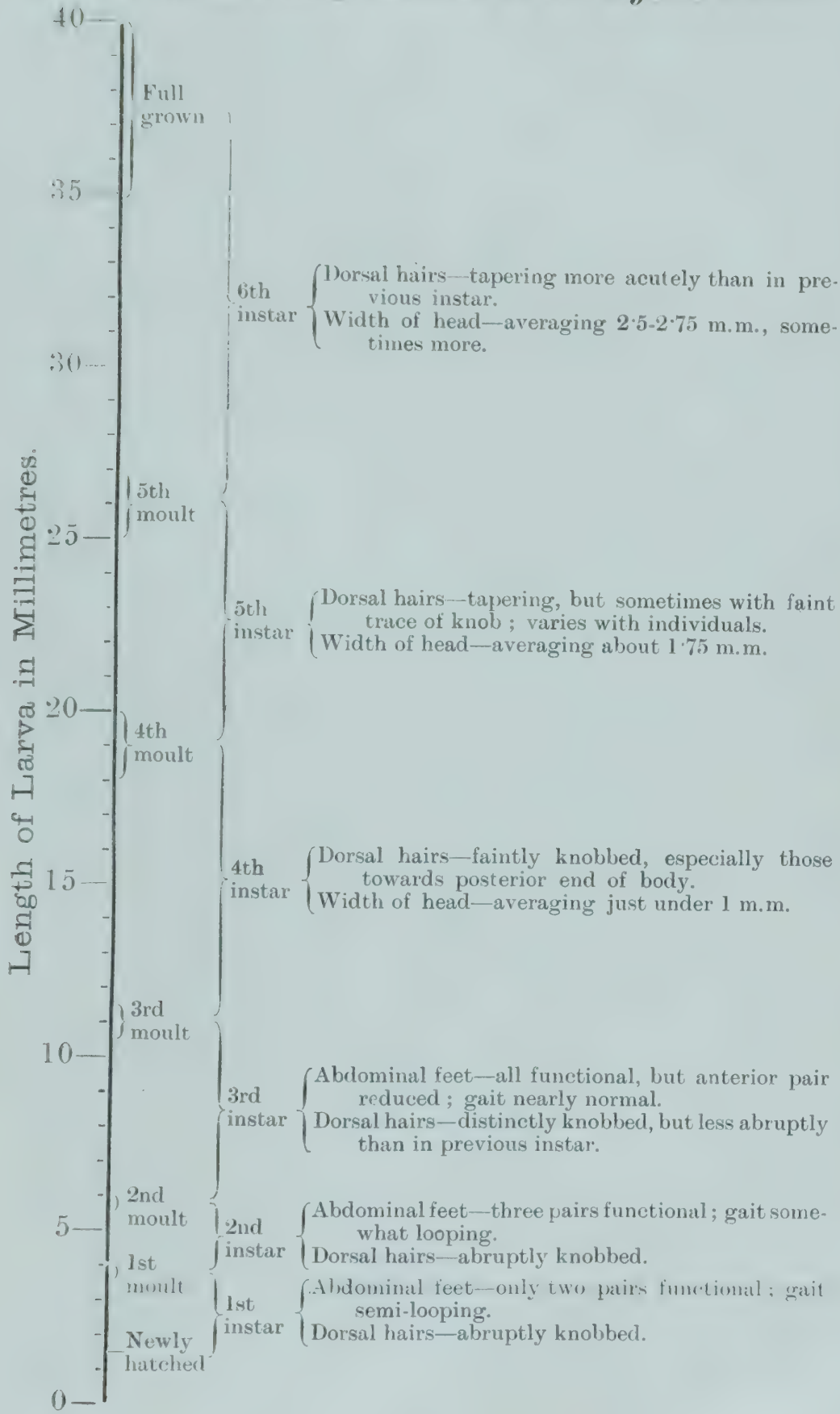

Cutworms sever the stem just above the surface of the soil.
Ground Level.
Wireworms (Tenebrionidae) attack the stem underground.
White Grubs attack the roots.

Chart illustrating Moults of *E. segetis* Larva.



The very young cutworms feed mainly upon prostrate leaves and other soft tissue within their reach. They will frequently ascend a plant for an inch or so in order to reach the lowest leaves. They keep in seclusion as much as possible, hiding under leaves and rubbish. They feed considerably during the day in sheltered situations, but will not face bright sunlight. They may, however, be seen in small numbers in the open on dull days. Later, they develop the habit of burying themselves in the soil during the day and feeding at night. As they grow larger, they feed upon the stems of plants at the ground level, frequently severing small stems completely through in a single night, so that the young plant is seen lying on the surface of the soil in the morning. This characteristic habit is the origin of the name "Cut-worm."

The growth of a cutworm from time of hatching to pupation may, under summer conditions in the presence of unlimited succulent food, be completed in as little as twenty-nine days, but the average is a few days more. In colder weather the growth may occupy several months.

The protraction of the larval period during the winter has been the subject of a number of experiments at Salisbury. In temperate climates attack on young crops in the spring is due to cutworms which have over-wintered in a partially developed condition, the temperature being sufficiently low to suspend the vital processes in the caterpillars so as to prevent starvation. Under Rhodesian conditions it has been found, however, that starvation supervenes very quickly during the winter if no food is available, and, as might be expected, the higher the temperature, within natural limits, the sooner the insect succumbs. Cutworms mostly die within ten days if kept without food during the summer months. One specimen lingered for a month, but was past recovery after about ten days. The following experiment illustrates the degree of resistance to starvation at a winter temperature. The cutworms were kept in the laboratory, where the mean temperature was about 60 degs. F., the maximum and minimum variation being about 10 degs. F. :—

> 3/7/16.—Six *E. segetis* larvæ, measuring 12, 18, 22, 24, 32 and 32 m.m. respectively, isolated in separate petri dishes without food or moisture. These cutworms are distinguished as a, b, c, d, e and f respectively.
>
> 17/7/16—a, d and f dead. 21/7/16—c dead; e, although much shrunken, is quite lively; inserted piece of dry maize stalk; b is very feeble, but capable of crawling slowly and of feeding; inserted piece of field radish to see if it can recover. 22/7/16—Added a few drops of water to earth in dish containing e; the maize stalk has been slightly eaten over-night; b has eaten much field radish, but still remains shrunken. 24/7/16—b dead. 29/7/16—e dead.

Other experiments gave approximately the same results, so that it is evident that at this temperature the larvæ of *E. segetis* are not able to survive for any great length of time without food. In the field the temperature at night is of course considerably lower than in the laboratory, but the day temperature is much higher.

It was thought, however, that the presence of dry maize stalks on the land might enable them to prolong existence, and specimens were therefore confined with this diet alone. It was found that the larvæ could survive considerably longer under these conditions, several surviving for nearly two months.

The practical value of these observations lies in connection with the question of whether eggs laid, say, in May, produce cutworms which can be destructive to the next season's crop. This is obviously not the case. The cutworms either feed up and pupate during the dry season, if they are able to find food, or die of starvation otherwise. Even were they able to survive the colder months of the winter, the warm weather in September, October and early November intervenes before the next season's crop is planted. During these months cutworms are in full activity, and have not the remotest chance of surviving without food. Knowledge of these facts considerably simplifies consideration of the factors influencing outbreaks of this pest and methods by which attack may be to a large extent avoided.

When full grown the cutworm enters the ground for an inch or two, and there constructs a cell or cocoon of soil particles cemented together. Within this cell it changes to a brown pupa or chrysalis, emerging as a moth in from a fortnight to three weeks in the summer. The pupal stage is more prolonged in the winter, the longest record being a specimen which pupated on the 14th June and emerged as an adult on the 2nd August.

The broods of cutworms are quite irregular throughout the year. Adults have been bred out in numbers during every month, but it is probable that they are most numerous in January and early February. In common with other moths which do not hibernate, the females must often be hard put to it to find food plants during the winter, but with the advent of the rains, food becomes abundant everywhere, and a great number of moths are matured. Late in the wet season disease frequently plays a great part in checking the pest.

Under summer conditions individuals may pass through all stages from the laying of the eggs to the emergence of the moths in as little as fifty days, but this appears to be about the minimum. The majority take from a week to a fortnight longer. The total period extends over several months in the winter. In the field there are probably about four complete generations of *E. segetis* during the year. This may be compared with a single generation in the British Isles and similar climates.

Food Plants and Damage.—Cutworms will eat almost any growing plant which is not of too flinty or woody a nature. There may be succulent plants which from their poisonous or disagreeable properties are not attacked, but they do not figure on the cultivated list. Some plants are, however, relished more than others. Amongst the favourites are root crops of various sorts, potato, tobacco, maize, lettuce, etc. *E. segetis* has been reared from the egg on grass and "blackjack" at Salisbury, but grass, unless of a very succulent nature, is not one of the most suitable foods, and many of the newly hatched cutworms failed to "make good" on this diet. Cutworms also shewed very little

liking for Napier's fodder (*Pennisetum purpureum*) at any stage during their growth. Their liking for maize, on the other hand, is quite remarkable. They will eat the heart out of the dry seed and eat into stems, which, besides being naturally dry, have been further desiccated for some hours in an oven. They cannot subsist for long on dry diet, however. Finally, cutworms have been convicted in the Cape Colony of injuring young fruit trees by gnawing the bark at the ground level.

By far the most extensive damage due to these pests is the cutting off of young plants at the ground level. This form of attack destroys whole plants at one stroke, and is excessively wasteful, as the insect eats only a fraction of what it destroys. Maize, tobacco and seedlings of all sorts suffer from this form of attack. Root crops suffer from the pests eating into the swollen roots at the ground level, whilst potato tubers are commonly attacked underground, although the foliage may be severed in the usual manner. Larger plants of many crops, such as maize and tobacco, may also suffer from attack at the ground level, though not to the same extent as the smaller plants.

Natural Checks on Increase.—Whilst no detailed study has been made of the checks on cutworm increase in Southern Rhodesia, enough observations have been made to indicate that inimical agencies are numerous, although not sufficiently effective to hold the pest in constant subjection.

Amongst the more obvious agencies which tend to prevent the undue increase of these pests are:—Climate, disease, insectivorous birds and animals, predaceous insects and internal parasites.

(1) *Climate.*—Whilst the genial climate of the Territory favours the pest in regard to the number of generations produced through the year, the prolonged dry season undoubtedly has an adverse effect. Rhodesian winters are comparatively warm, and in consequence the development of the insects continues, although, of course, somewhat retarded. In consequence, moths are on the wing seeking for food plants, amongst which to lay their eggs, at a time when suitable plants are exceedingly scarce, being, in fact, confined to naturally or artificially moist situations. The moths, therefore, must commonly fly far afield in their search, and not only may they fail to find the desired spot, but they run heavy risks of falling victims to enemies in the meantime. Moths emerging during the latter part of the dry season in the neighbourhood of Salisbury or Bulawayo, for instance, would need to travel far before encountering a naturally moist situation furnished with the required class of vegetation. Some parts of the Territory are, however, more favoured than others in this respect, and whilst winter gives the pest a severe check in dry flat country, it may not do so to the same extent in more broken parts, where surface moisture persists in the lowest lands throughout the dry season.

(2) *Disease.*—Cutworms, in common with other caterpillars, are very subject to epizootics of disease during the summer months. Time after time the stock of cutworms kept in hand for experimental work at the laboratories has been completely destroyed through this agency. In the field disease has also been noted, causing wholesale destruction amongst the pests, especially during the latter half of the wet season

(Feb.-Mar.), and undoubtedly it constitutes one of the most potent checks on cutworm increase.

The commonest form of disease may be referred to as "wilt." This has all the symptoms of and is probably the disease which is termed "flacherie" in the silk industry. It appears mostly to attack cutworms of the last two instars, that is, those which are more than half grown. The caterpillars lose their appetites and their usual healthy turgidity and quickly die. After death, they become dark in colour and smell offensively. The disease sometimes does not appear until after the insect has pupated, in which case it is the pupa that dies, becomes black and quickly rots. This disease seems to be favoured by a warm damp atmosphere. It has not been observed either in the laboratory or the field during the winter months.

Another disease was observed by Mr. R. L. Thompson, Assistant Entomologist, attacking *A. ypsilon* larvæ in the laboratory. He describes the symptoms as follows:—"The larvæ when they die first become stiff, rigid and wax-like to the touch, then after a few days they become covered with a dense mat of white fungus threads, which later develop masses of small green spores, which cover the larvæ and spread to the surrounding soil." This disease has also been observed in the field, but chiefly on leaf-eating caterpillars.

Both the above diseases are infectious, and it may be possible some day to spread epizootics of the same or a similar nature artificially amongst cutworms and other caterpillars in the field. A certain amount of work has been carried out with this object in view in various parts of the world, including South Africa, but the results have not been very satisfactory. The diseases tested seem to depend largely upon climatic influences for their action, and generally appear naturally when conditions are favourable, whilst artificial infection fails when conditions are adverse. However, there is a wide field for further research in this connection.

(3) *Insectivorous Birds and Animals.*—The cutworms' habit of burying themselves in the soil during the day acts to some extent as a protection against birds, but the protection is by no means complete. Crows probably dig up great numbers in badly infested land, and undoubtedly do a great deal of good in destroying various pests before the crop is planted. Birds which eat or feed their young upon smooth caterpillars incidentally destroy numbers of cutworms. These are probably specimens which have either buried themselves imperfectly (a common thing with small cutworms) or are feeding in the open on dull days. In badly-infested lands cutworms frequently move about freely during the day, and under these circumstances storks, etc., may do a considerable amount of execution. The moths themselves are also great delicacies amongst both habitual insect-eaters and also seed-eaters, and are eagerly pursued and devoured when disturbed during the day from the low-growing vegetation which they frequent. Moths flying during the night may also be snapped up by night-jars. The food of our native birds throughout the year, however, constitutes a subject for prolonged investigation by itself, and cannot be more than referred to in this paper.

Among the insectivorous animals which may take their toll at times of either the larvæ or the moth may be mentioned moles, hedgehogs, shrews, jumping shrews, galages ("night apes"), and possibly some of the larger species of bats.

(4) *Predaceous Insects.*—In common with other soil-inhabiting larvæ, cutworms are frequently destroyed by the more aggressive species of ants, particularly the marauding ant, *Dorylus helvolus*, and its allies. Mr. Thompson also records having seen a cutworm moth, *A. ypsilon*, which he disturbed, seized and pierced by a large robber fly (*Asilidæ*). Flies of this family are great feeders on moths, and the writer has noticed them feeding upon various species on several occasions. Apart from the above, records of attack on cutworms by other insects in Southern Rhodesia are wanting, but no doubt the larvæ fall a prey to predaceous beetles and bugs at times, whilst the moths may occasionally be seized and devoured by large dragon flies, Hottentot gods, etc.

(5) *Parasites.*—At least five species of parasitic flies (*Tachinidæ*), four specimens of Ichneumon "wasps" and one Braconid have been bred from *E. segetis* at Salisbury. The most persistent cutworm parasite seems to be the Tachinid fly (*Gonia bimaculata*, Wied.*), which has been bred out in numbers from cutworms collected in several districts. It is interesting to note that this species has not been bred by the writer from any caterpillars other than cutworms, so that its attack on these pests is obviously not merely incidental. Seeing that the fly is diurnal in habit, whilst the cutworm is nocturnal, the method by which the fly obtains access to its host in order to lay its eggs would be interesting to observe.

Another common species was identified as *Wagneria nigricans*, Meig., through the courtesy of Dr. Lionel Peringuey, Director of the South African Museum, Capetown. Only occasional specimens of the other parasites have been bred.

Tachinid flies lay their eggs on the body of the caterpillar, and the maggot on hatching makes its way into the tissues of its host. The parasitic "wasps" insert their eggs into the body by means of their sharp pointed ovipositors. In both cases the larval parasites live on the body fats and other non-vital portions of the cutworm until they have nearly completed their growth, when, the life of the caterpillar being no longer vital to the parasite, they finish their feeding indiscriminately and enter the pupa stage either within or outside the body of their victim. Parasitised caterpillars may either die in this stage, or change to pupæ. In the latter case, it is the adult parasite and not the moth that emerges.

The question of the utilisation of natural parasites for the control of insect pests generally has received a great deal of attention from entomologists, and considerable success has attended their efforts with regard to certain classes of insects under particular circumstances. In

*Kindly determined at the British Museum through the agency of Dr. Guy A. K. Marshall.

connection with cutworms in Southern Rhodesia, however, the prospect is not a hopeful one. Cutworms are pests which increase rapidly, and commit their depredations within a very short space of time. The action of parasites, on the other hand, is comparatively slow. Even were it possible to breed and keep on hand large numbers of parasites at various centres ready for introduction to infested lands, the parasites could have very little effect in reducing an outbreak, though they might materially reduce subsequent broods of the pest. In maize lands it is only the spring or early summer broods which are of importance, due not only to the growth of the maize, but also to the fact that moths emerging during the wet season can find food for their young everywhere, and consequently do not concentrate to a high degree in the maize lands, especially if the latter are kept free from weeds. It is conceivable that parasites might be used to some effect on irrigated lands during the dry season, as these are liable to suffer from more than one brood of cutworms, but the practical difficulties in the way are enormous. The most abundant parasites are Tachinid flies, and a method of inducing these to breed in confinement has yet to be evolved. Even were this difficulty surmounted, the work would involve the employment of quite a staff of assistants, which would not be justified by the very slight prospects of success.

These remarks are inserted because farmers in general very much favour the idea of natural control for pests, as it not only involves no labour, but, if effective, could be applied to crops which cannot be treated with insecticides. It is well, therefore, that they should appreciate the practical difficulties that lie in the way of an effective utilisation of these natural checks.

Factors Influencing Cutworm Outbreaks.—Whilst damage from cutworms involving very small areas may be to some extent fortuitous, outbreaks on a large scale are evidently due to some definite factor or combination of factors. Obviously the immediate cause is an unusual concentration of eggs from a number of female moths within a certain limited area. This area may be included in the land that suffers later or lies somewhere adjacent thereto. A concentration of eggs of this nature can only be brought about by the fact that at the time the area concerned bears vegetation of a specially attractive nature. This special attractiveness may be due to the intrinsic qualities or condition of the plants concerned, or to the fact that other suitable vegetation is wanting or very scarce in the vicinity.

Bearing these facts in mind, we are in a position to consider the causes of cutworm outbreaks in relation to various classes of cultivation.

(1) *Dry Season Crops, Seed-beds, etc.*—Throughout the greater part of the Territory green vegetation is very scarce during the latter part of the dry season. Spots where such occurs, whether due to natural or artificial moisture, are therefore very attractive to the female moths, which are on the wing throughout the year, seeking a suitable environment for the deposition of their eggs. It is obvious, therefore, that most crops growing during the dry season are from their mere presence at that time liable to suffer severely from cutworm attack. Such

attack, except in regard to carefully constructed seed-beds, cannot in fact be guarded against.

(2) *Maize and Wet Season Crops.*—Most damage to field crops, such as maize, is done early in the season whilst the plants are small. The eggs from which the cutworms hatch in such instances are laid before the crop is planted, and the concentration of eggs is due to the presence of attractive vegetation on the land or close at hand at that time. Although we know the time cutworms take to reach a certain size in the presence of an unlimited food supply, it is not possible to give accurate dates with respect to the laying of the eggs, as the food supply may have been interrupted in the meantime by cultivation or other causes. Speaking roughly, cutworms which are large enough to injure maize seriously during the latter part of December have usually hatched from eggs laid some time in November, probably early in the month.

From these facts we can understand to some extent why it is that cutworms do little damage to maize on areas of the nature of the Gwebi flats, whilst they are very troublesome on the rich low-lying lands of the Mazoe Valley and elsewhere. The lands on the flats as a rule do not spring up into weed-growth until a general soaking rain has fallen, and plant growth is simultaneous all over the veld. In addition, red land is not so fertile as vlei land. Rich vlei land is retentive of water, and naturally receives more than its share owing to its low position. Furthermore, it tends to carry more weeds. The consequence of this is that, after the first showers of the season, vlei lands are apt to present an array of vegetation, whilst higher land has not responded to the rain to the same extent. The influence of a more luxuriant vegetation may continue more or less throughout the season owing to the fact that it is difficult to keep such land free from weeds.

The use of kraal manure is commonly stated to encourage cutworm attack, and so many instances have been brought to the writer's notice that there appears small reason to doubt its influence in this respect. In fact, such a result is to be expected, not because cutworms are actually introduced to the land with the manure, but for the same reasons that vlei lands are more liable to attack than uplands. Kraal manure increases the humus content of the soil, makes it more retentive of moisture, more fertile, and generally introduces a large number of weed seeds. The result tends to be an earlier and more luxuriant weed-growth, hence the cutworms.

Whilst the influence of rich low-lying lands is generally plainly discernible in respect to cutworm attack, instances commonly occur where the lowest lying land is not badly attacked, whilst higher land, perhaps red soil, suffers severely. The writer freely admits that some cases are difficult of explanation. It must, however, be realised that cutworms do not necessarily remain where they hatch out, but may wander a considerable distance afield in response to various impulses. Lack of food is, of course, a very strong stimulus, but in many instances is obviously not the explanation. It appears that under certain circumstances cutworms tend to migrate to higher ground for its own sake,

quite apart from any question of the food supply. If these insects were gifted with reasoning powers or highly developed instincts, it would be possible to explain this tendency, because it would render them less liable to wholesale destruction by floods and to devastating epizootics of disease, which are encouraged by crowded damp conditions. It may be that some dim inherited impulse is at work in this connection, but, as the movement does not always take place to higher ground, the explanation cannot be regarded as altogether satisfactory. Probably we have to do with a number of conflicting impulses, of which one or other may be uppermost, according to circumstances.

Apart from such extensive outbreaks in the early part of the season as have been dealt with above, cutworms may continue abundant and destructive in small areas, such as kitchen gardens, throughout the wet season. This is mainly due to the attractive nature of the plants that are cultivated in such situations. Plants such as potatoes, turnips, parsnips, beetroot, lettuce, etc., provide an array of green stuff that with little doubt appeals to the pregnant female moth considerably more than the native grasses of the veld.

Moths are also very apt to lay eggs amongst very young plants which are just appearing above ground, provided they are growing thickly enough. Under such circumstances, the tender seedling leaves are within easy reach of the young cutworms, and on hatching out they find themselves in a very favourable environment. A small plot of sesamum which germinated very thickly at the experimental station, Salisbury, was entirely demolished by young cutworms at the beginning of February this year. After finishing the last plant, these cutworms did not average more than half an inch in length.

(*To be continued.*)

Local Food Products.

In April we completed the series of recipes under the title, "Maize Foods for the Home," which was a reproduction, by permission, of a Transvaal bulletin. We have had reprints of this made for the benefit of any of our readers who may wish to have the recipes in a compact form. In order further to encourage the use of locally-grown food stuffs, we propose to publish cooking recipes which will specially apply to the use of ground-nut and buckwheat products. These will be compiled from various sources, and we should be greatly obliged if any of our readers would help us by sending in recipes which they have found useful, and we shall, of course, acknowledge the source of our information in each case.

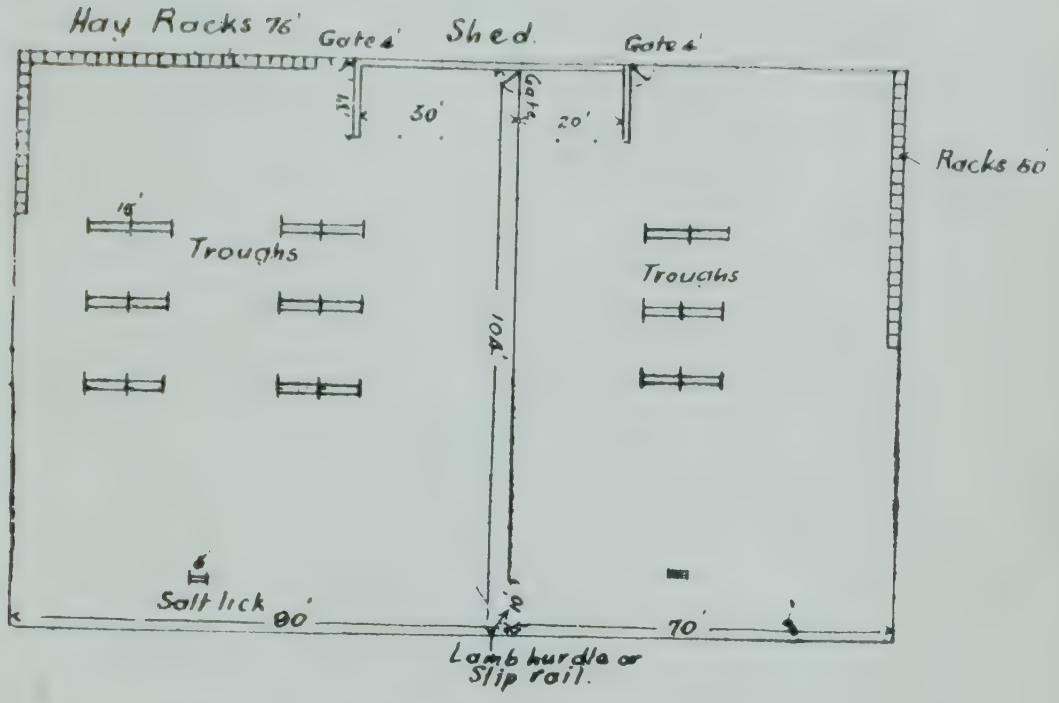
Sheep Farming for Mutton Purposes

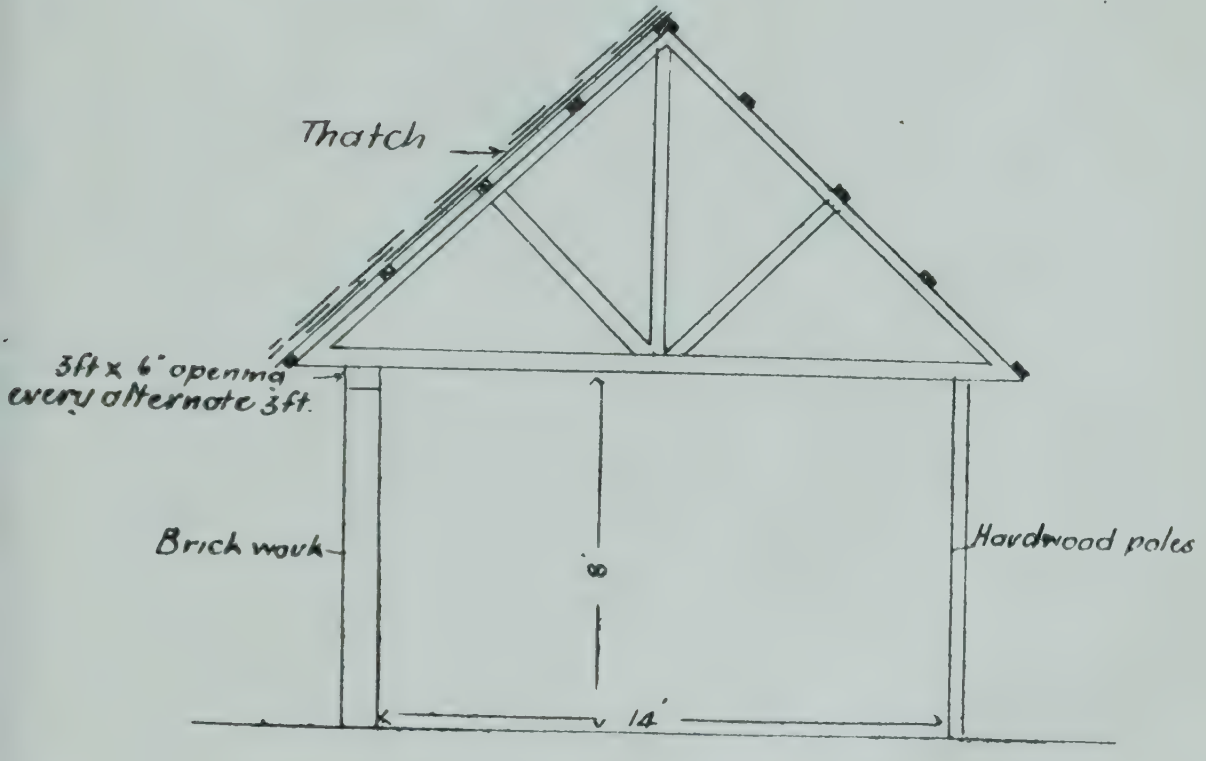
ON GRANITE VELD AND MIXED FARMS.

By R. C. Simmons, Controller, War Settlement Department.

There are few, if any, farms in Southern Rhodesia on which one would advise farmers to invest money in sheep for wool production only, in the sense that such an investment is understood in Australia, or in the Free State, or in other similar wool-growing countries. Generally speaking, the coarseness of the veld, the rainfall and the presence of various predatory wild carnivora militate against the farming of merinos or other sheep, the main return from which is looked for in the form of wool. Such a flock in this country must live almost entirely in the veld in order to provide a margin of profit, and cannot be expected to prove very profitable under conditions which necessitate nightly kraaling and herding in small flocks, with the consequent constant driving over long distances which such methods entail. The position of the settler on a granite veld farm is such that he must look for his living chiefly by feeding crops to cattle or small stock in winter. The reasons for this are three-fold. Firstly, because most of such crops as he may grow readily and safely are not very easily marketable in a raw state, and must be turned into something else, such as dairy produce or meat, which is portable and marketable. Secondly, it is advisable that the settler should not have all his eggs in one basket as it were, but should take up dairying, beef and mutton production, poultry and so forth, so that in case one line fails, the other may possibly see him through. Thirdly, the granite veld farmer requires manure for his land, and to this end he must, as far as possible, keep such a class of stock, large or small, as will pay to feed artificially.

It is common knowledge that in order to avoid fluke, wire worm and other diseases, sheep must be kept out of the vleis and lower lying river lands, except in the driest time of the year. It is also well known that sheep do not thrive on rank long grass, but should be grazed on the sweeter, shorter veld that has been well kept down by cattle or has been mown. Under these circumstances, it will often be found in practice, on a new farm, that very little of it is suitable for sheep, and, therefore, that sheep in sufficient numbers to pay for wool only could not be kept without much artificial feeding. Under conditions such as obtain in this country, it will not pay to feed for wool only, but sheep which will produce a well-grown carcase at eight or nine months of age, in addition to a fair yield of wool, will pay for very intensive farming.





Section of Shed.

The annual value of the mutton imported into this country in the last few normal years amounts to something in the neighbourhood of £50,000, and there exists an export trade to the Congo of approximately £10,000 worth of sheep per annum, a trade which may reasonably be expected to increase after the war. Recent developments in the way of facilities for exporting beef justify one in assuming that the internal demand for mutton will increase, irrespective of any possible increase in the population. Taking all these factors into consideration, there appears little room for doubt as to the wisdom of making every effort to produce good mutton sheep. It is the opinion of the writer that the production of mutton in this country is essentially the work of the small farmer, and that it can be undertaken by him with a minimum of risk and every hope of profit. Like most of the work on a small farm, mutton production calls for more or less intensive methods, as compared to the extensive methods of the cattle ranch or the large sheep run, and the value of the manure alone, apart from any cash profit, may often well repay the farmer for his trouble.

Method of Breeding.—Just as the cattle rancher seeks to grade up the local or mixed cattle with bulls of beef breeds, so the mutton sheep breeder must grade up the local flocks with rams calculated to impress large frames and early flesh-producing qualities on their progeny, rather than wool. He need not despair of producing a marketable wool, and indeed he may quite possibly breed a big, early-maturing carcase bearing enough marketable wool to pay herding expenses, etc., but he must let early maturity and size of carcase be his first consideration, and be content to consider the wool as more or less a bye-product. Most breeds of sheep which are entitled to be called improved mutton breeds have bigger, heavier carcases than purely wool breeds, and it is, therefore, essential that the ewe selected to mate with a mutton ram should have size and constitution to enable her successfully to give birth to and rear the big mutton lamb. For this reason the merino ewe, being relatively small of frame, is sometimes crossed first with one of the larger English wool breeds, and the progeny are then put to the mutton ram. In Southern Rhodesia, should the farmer desire to start grading for mutton from merinos, some such course as this may be advisable, but the Shropshire, being one of the smaller-boned mutton breeds, crosses quite satisfactorily with the merino, and by its use one may avoid the necessity of first using a wool cross.

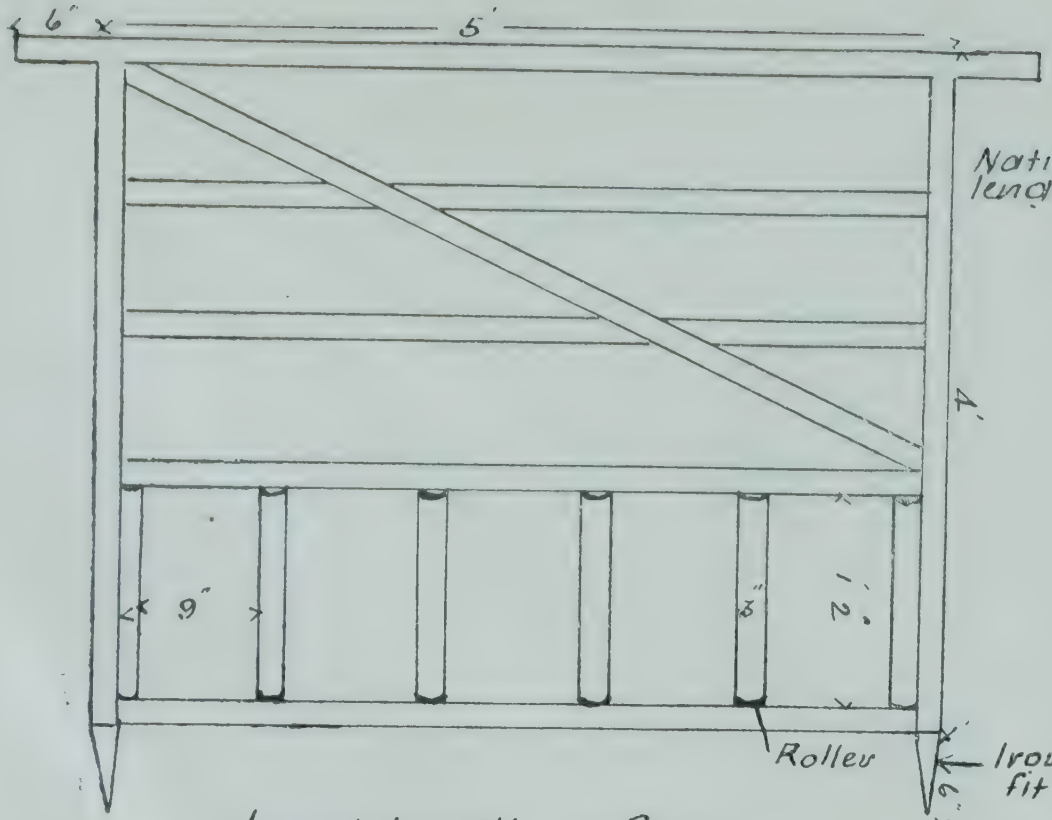
In most instances the kind of flock which the new settler may purchase at a reasonable cost and put on his farm with the least risk will be one of locally-bred ewes, being crosses and mixtures of merino, Persian, fat-tailed and perhaps woolled Persian. According to the percentage of merino in them, so they will bear wool, but in many instances they will be woolless from a commercial point of view. The settler should endeavour to purchase from 50 to 100 (not more) of such ewes, taking care that they come from a healthy European source, and that they possess size and constitution. It is, as a rule, best to stipulate that they shall not be more than four teeth and not less than two, although a few older ewes amongst the flock may be admitted, provided their mouths are sound and the ewes themselves are strong and thrifty. Weak, undersized, unthrifty sheep, such as are sometimes obtained

from native sources, are best left alone, and we will not consider them in connection with the subject under discussion. The writer would emphasise the point that the flock should not exceed a hundred breeding ewes, at any rate until the settler has had one or two years' experience, and has satisfied himself that the size of his farm and the exigencies of his business will allow him to carry more. This number is such that, on an ordinary new farm of the kind referred to, shedding, troughs, watering arrangements, etc., may be provided at a minimum cost, very careful daily inspection will be possible, and the choicest grazing will suffice for the keep of the flock without the necessity of running it on the coarser and less suitable parts of the farm.

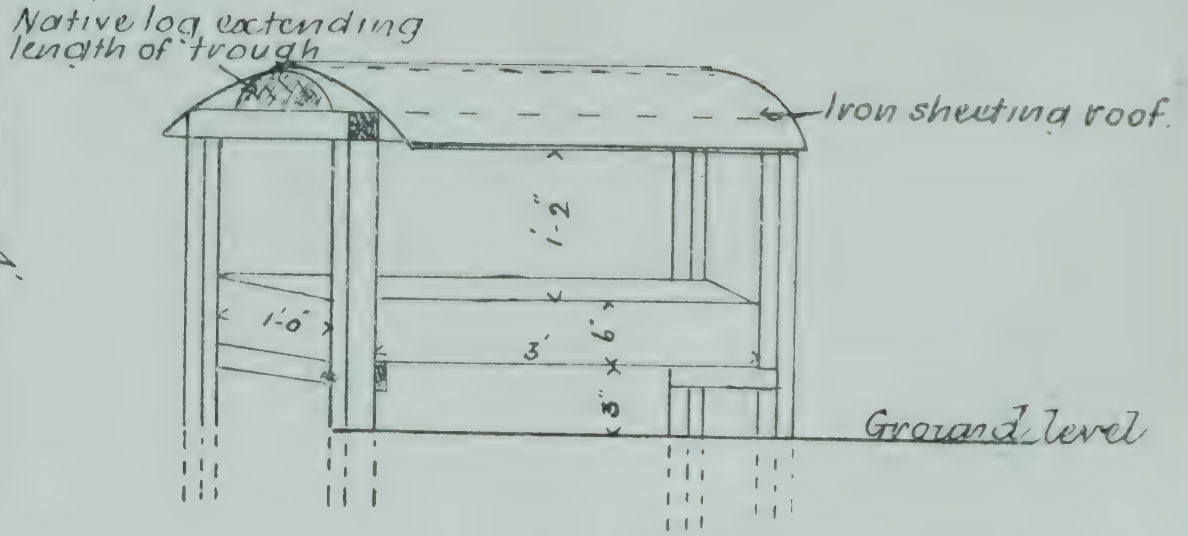
Unfortunately, it is not possible to say exactly which mutton breed will be the best improving breed for Rhodesia, or for any particular part of the country, nor just how long one may successfully continue the use of the pure-bred ram. The experience of quite a number of farmers justifies us, however, in assuming that (for the purpose under discussion) any of the British short-woolled mutton breeds may be used successfully for one generation. While it remains for both the private individual and the Government to find out how much further one may go, we may at least be fairly sure that the result of the first cross will be a much improved, much earlier-maturing lamb, and one which will respond to feeding in a greater degree than any of the local types of sheep. The settler has, therefore, something safe and tangible to be going on with, and need not hesitate to begin because at the moment he is not quite sure how he is going to continue.

Amongst the breeds one would suggest are the South Down, the Oxford Down, the Shropshire, the Suffolk, the Hampshire Down, the Romney Marsh and the Dorset Horned. The continued use of any of these would tend to produce a very saleable wool, in addition to carcase, and would probably produce a sheep more suitable to our heavy rainfall than is either the merino or Perisan. While any of these breeds may be imported, the cost and trouble of doing so during the next few years will probably be great. The Oxford Down and the Romney Marsh are amongst the very few breeds which may be obtained locally, or in the Union, and no doubt the new settler will, more often than not, have to be content with one of these. As an alternative to the above breeds, and one which has already given considerable promise in the drier parts of the country, the Woolled Persian ram may be recommended. Crosses with this breed, or merinos, local sheep and Cape sheep have given big early-maturing carcases and a very fair clip of saleable wool. These crosses also respond to feeding. Should it be impossible to get a ram of either of the above-mentioned breeds during the settler's first season, the use of a good big fat-tailed ram may be recommended as likely to put size, substance and hardiness into the flock, and make them better fitted for mating with the mutton ram without losing anything in the way of flesh.

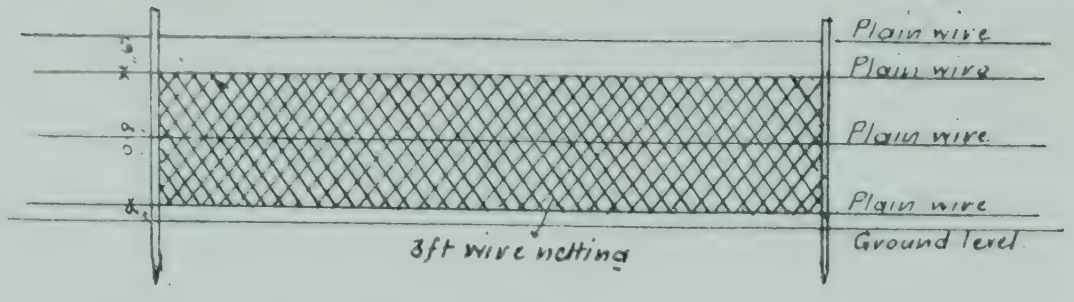
Time of Lambing.—Although no hard and fast rule can be laid down, the autumn will generally be found the best time of year for ewes to lamb. The ewes should normally thrive on the natural grass alone from the time of being put to the ram in December until May,



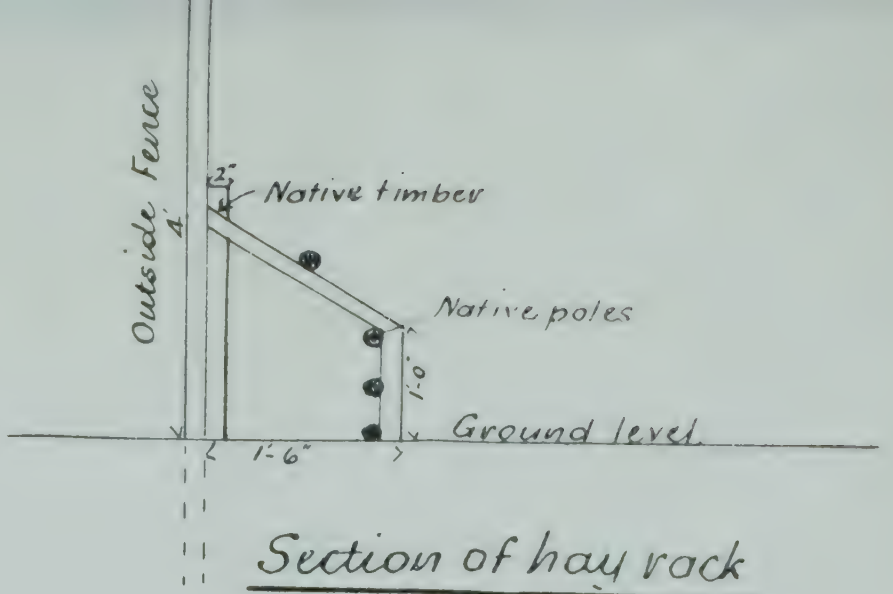
Lamb hurdle or Creep.



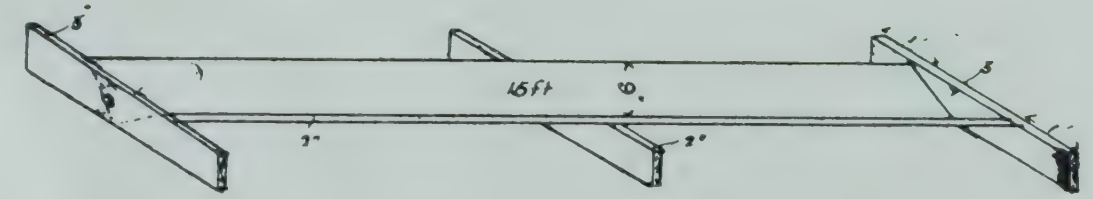
Salt Trough.



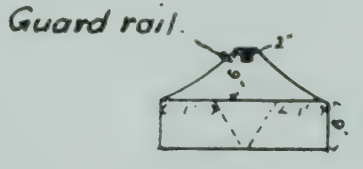
Boundary Fence of Yards



Section of hay rack



Sheep trough.



Sheep trough, end view.

Alternative shape allowing for guard rail along centre of trough

and by that time the farm will usually be able to provide all the necessary food and grain required to supplement the veld. Young lambs suffer more from wet than from dry cold, and, in any case, it is easier to provide against excessive cold than excessive rainfall. In May or June ticks and other insects which may retard the growth of young lambs are less prevalent, and the May or June lamb weans out normally on to good grass in the spring. In order to arrange for the arrival of all the lambs about May or June, the rams should be put with the ewes about December or January for about six weeks. If both ram and ewes are fit at the time of mating, this will result usually in the bulk of the ewes being served. Should an odd one or two be missed, it is often better to let them miss altogether than to have odd lambs appearing at all times of the year out of season. On no account should the ram run with the ewes except for a specified time as indicated, and, however difficult it may be on a raw unfenced farm to keep the rams apart from the flock at other times, it is essential that it should be done, even if the rams have to be sent right away to a neighbour.

Feeding.—A little time before lambing, and also while the lambs are young, the ewes should receive a daily ration of about ½ lb. of crushed maize per head and about one-sixth of a lb. per head of ground nuts or beans. In addition to the grain ration, they should have about 4 or 5 lbs. per head of ensilage, majordas or other cheap succulents, and as much sweet veld hay as they will eat. As soon as the lambs begin to eat any appreciable quantity of the grain ration, they should be given it in small quantities, and apart from the ewes, in a pen to which they can gain access by means of a lamb hurdle or lamb creep, which allows of the passage of the lambs, but through which the ewes cannot pass. As the lambs grow older, the total grain consumed by ewes and lambs will probably amount to 1 lb. per ewe per diem. The proportion given to the ewes will gradually be decreased, and a corresponding increase will be made in the amount fed to the lambs. By about August or September, when the lambs are ready to wean, they will be having all the maize, and the ewes will be getting hay and succulents only. It will be seen that this method automatically reduces the feed of the ewe, as her milk is less required, and facilitates her early drying off, so that she may pick up flesh and condition on the spring grass and come to the ram in good fettle in December or January.

So far as the lamb is concerned, the farmer's object will be to keep him constantly growing and increasing, and to sell him fat at about eight or nine months old. His corn and hay ration will be continued, and will only be lessened as the natural veld becomes able to maintain his satisfactory growth and increase of weight. Succulents, of course, will not be needed when the grass is available. Should maize be very expensive, teff hay or velvet-bean hay and sweet potatoes may be used instead, and will be found a very excellent feed, especially for ewes and young lambs. Ground-nut vine will also be found a splendid feed for this purpose. It is very essential in feeding sheep to provide sufficient clean trough and rack room; feeding on the ground or in troughs which are too small is most wasteful, and is bad farming.

Housing.—In order to maintain his flock on the lines recommended in the foregoing, the settler is advised to provide a permanent shed and yard for them near the homestead, just as he provides a stable for his horse or cows and a sty for his pigs. The most suitable type of shed for dealing with a flock of 100 breeding ewes and their progeny will be one which is closed at the back and the two ends and entirely open in front. In places where, in order to protect the sheep from carnivora, it is necessary to close the shed entirely at night, this may be done with stout wire netting, supported to some extent by plain wires or poles set well apart. It is essential that there should be no solid barrier in front which can obstruct the air or sunlight from reaching all parts of the floor. The best material for the walls will be brick or stone, but as a temporary measure, and where suitable wood is available, these may be of hardwood poles set close together. Dagga walls or pole and dagga walls are not very satisfactory. Iron answers the purpose very well, but will in most instances be too expensive. The roof may be of thatch or iron. Either in front or around the shed a suitable good sized yard or kraal should be provided in such manner that both the yard and the shed may be divided into two when desired. It is most important that good clean troughs, hay racks and salt boxes should be provided. The sketches attached hereto will be of service in assisting the settler to provide the necessary accommodation. It may perhaps be mentioned that the kraal site should be chosen so that the drainage is all from one side, and that the shed should be placed on the high side.

Shearing.—In the breeding of wool-bearing sheep, the principal drawback in some districts is the liability to collect grass seeds in the wool, which penetrate the flesh in such numbers and to such a depth as to injure seriously the health of the sheep, and render the mutton unsaleable. The new settler should, therefore, make careful enquiries of older settlers in the neighbourhood before deciding to breed for wool as well as mutton. The difficulty may, however, be overcome in the case of small flocks, either by shearing twice a year (at the time of the grass seeds and again in about September), or by keeping the sheep only on well-grazed pasture or pasture that has been mown. From the point of view of the value of the wool, it is best to shear once a year as soon as the weather becomes warm in spring, and sufficiently long before the first heavy rains are expected, so that an appreciable amount of fleece will have grown again as a protection.

Extracts from the Report of the Director of Agriculture

FOR THE YEAR 1917.

Presented to the Legislative Council.

Our rural industries have, in every respect and relation, been influenced by the war, and for the great part adversely, Rhodesian farming having benefited very little, almost negligibly, in comparison to the burdens and losses imposed thereby. It is true that the price of maize was undoubtedly beneficially affected, and that a ready market was obtained for slaughter cattle, yet these are but trifling gains to set against the misfortune arising from the war; the absence of so large a proportion of our able-bodied farmers; the virtual cessation of immigration of settlers; the closing of the outlets for many forms of produce, especially those for which markets were in process of being established; the scarcity of native labour, resulting from its employment elsewhere; the increased ocean freights outwards and inwards; the greatly enhanced price of fertilisers and all implements, especially spare parts of tools and minor farm appliances and of bags, as well as of all commodities for which we are still dependent upon outside sources. The lack of outlets is the more grievous in view of the urgent need and high prices for such commodities as we can supply, if offered in the great overseas centres of consumption. These adverse circumstances have to be recognised and met, and, in spite of them, it is the more pleasing to record sound progress in many directions, much more than might have been expected, and good testimony of the inherent virtues of the country. Reliable evidence of this is found in a statistical comparison with previous years, which in so many instances shew progressive increases, in spite of a season not too favourable, and nowhere a noticeable reduction in farming activities.

For the second year in succession a shortage of rainfall occurred at the most critical period, the height of the growing season, a phenomenal occurrence as unexpected as it was undesired.

Labour has been referred to as insufficient, yet the shortage was not such as to hamper seriously farming development, but it led to a larger number of farmers availing themselves of the services of the Labour Bureau, which now claims 1,201 farming members, whom it supplied with 5,221 boys, or 51 per cent. of the total labour distributed.

The Width of Tyres Ordinance came into force on 1st April, and, despite prognostications of evil, has caused no insuperable difficulty or

dislocation of traffic. Automatically the narrow tyre will tend to disappear, to the unquestionable advantage of our future roads.

Under the Brands Ordinance, 147 new registrations were recorded, the total now standing at 6,282.

Steady progress and development is observable in almost every direction in matters pertaining to live stock; indeed, the past year has probably been the most fruitful of any in our history in this connection. The lines on which the cattle industry will develop are now taking definite shape as regards ranching, dairying and feeding. Progress is noticeable in the knowledge amongst farmers in general of stock diseases and of preventive measures thereto, especially as to the prophylactic value of dipping, and this intelligent interest is invaluable, even if accompanied by much excitement and agitation. In our larger centres stock-yards on up-to-date lines have been erected, and the trade is better organised. Markets are opening up equal to present needs, and the stock owners have themselves financed the first meat packing factory. Importations of superior breeding stock are continued even in the face of great difficulty, the need of improvement being now universally recognised. The year under report has also been very favourable to the increase and condition of cattle.

The number of cattle in Southern Rhodesia at the end of 1917 is found to have been 1,083,543, of which 531,911 were European-owned and 551,632 owned by natives. The increase under the former category is 13.53 per cent., compared to 18.6 and 15.4 in the two previous years; of the latter 12.22 as against 10.2 and 9.8 per cent. The rate of increase and its fluctuation is partly to be explained by sales to Europeans from natives, by importations from the Union and overseas of stud stock, as well as by a greater natural increase amongst the better cared for European-owned cattle. Against this the exports of cattle from Matabeleland to the Union have been considerable, amounting to 13,221 head, of which two-thirds were conveyed through Bulawayo and Plumtree, and one-third passed over Liebig's Drift on the Limpopo River. Since the commencement of this trade in 1916 to date of this report, 25,519 animals had been exported to the Johannesburg and Pretoria abattoirs. Arrangements have been made to apply the system to the whole of Southern Rhodesia, whereby some further extension of trade may be anticipated, although it may be found that some parts of the country are too remote to admit of direct despatch to the above centres. Two ports of exit are now in use, the one by rail through Bulawayo and Plumtree, the other across the Limpopo River to Messina, in the Transvaal. A further fillip to the cattle trade was given by the announcement of the Imperial military purchase of cattle. Good progress is reported in the undertaking of the Rhodesian Meat Packing Company for the erection of its factory at Odzi, which should furnish yet another outlet for the disposal of stock. The local retail price of meat has risen proportionately, so that the consumer directly suffers through the good fortune of the cattle-raising section of the community.

A milestone in our progress was marked by the transmission of the first consignment of beef from Rhodesia to Smithfield Market. The cattle in question were sent alive to Johannesburg and were exhibited

on the fat stock show there, taking several prizes, and the meat was afterwards sent in frozen condition to England. Actually the cattle left Rhodesia in 1916, but it was in January, 1917, that the meat reached the London market, where it was very favourably commented upon. The names of the breeders and feeders deserve to be chronicled. These were Mr. E. A. Hull, of Westacre, Matopos (Shorthorns); Mr. R. Granger, of Monaro, Figtree (Herefords); Mr. F. E. Woods, of Mimosa Park, Nyamandhlovu (Aberdeen Angus); and they are to be congratulated on the achievement.

The rapid diminution in the importation of meats—fresh, frozen and preserved, including hams and bacon—was referred to in the last annual report as noticeable for the last seven years, but the figures are again so striking that no apology is needed for repeating them for the more recent years and including those for last year:—

	lbs.	Value.
1914	1,530,610	£46,595
1915	728,508	27,375
1916	278,259	14,275
1917	79,362	3,852

No doubt the remarkable reduction is due in large measure to war conditions, but the fact emerges that the country has been able to do without these things, and can no doubt in future continue to do so, although, to some extent, foreign luxuries, such as Alaskan salmon, Australian rabbit, Chicago beef and English bacon, Russian caviare, and even German sausage, may re-appear. Rhodesia can, however, supply her own real needs in this respect, and is spending the money within the country.

The need of good bulls is now generally recognised, as is shewn by the fact that during the year 99 bulls and 100 heifers were imported from the United Kingdom, and 239 bulls and 2,527 heifers from the Union, over 1,000 more than in the previous year. Pure-bred cattle of European breeds numbered on 31st December, 1917, 3,694, an increase of only 224 head for the year. Shorthorns, which are the most numerous, have increased by 32 head, and now stand at 1,298; Devons have increased by 201 in numbers, and now rank second with 678; Frieslands follow with 602, then Herefords 532, Aberdeen Angus 207 and Sussex 195, the small remainder being made up of South Devons, Ayrshire, Red Poll and Jerseys. The number of Africanders remains stationary at 1,803, as against 1,804 last year. There is undoubtedly much room for more good bulls, and the high prices that have to be paid must act as a deterrent to improvement, whilst it has to be admitted that there are many bulls in use to-day which could be replaced by better animals if the owners could afford it. The importance of this subject can hardly be exaggerated, and the need increases with time. It has been fully demonstrated that the crosses of many British breeds are excellent, and that we can produce beef of a type eagerly bought in the markets of the Union and of Great Britain, but this high quality is far removed from the common herd, and before we can export uniform ship loads of prime beef, there is need of much improvement on the lines

now known to be successful. Our past dilatoriness can only be atoned by now making prompt provision for the future.

The dairy industry is being held back by circumstances connected with the war, the absence of many farmers at the front, who, if here, would be going in for it; difficulties in the way of commencing the new creameries intended to be started; impossibility of securing vats and appliances for cheese making; also lack of competent cheese makers; and, finally, the want of a dairy expert to guide beginners in cheese making, butter making and cream production for the butter factories. There is much to be done in these directions, and the present is a favourable time when a new interest in these subjects is being manifested.

The supply of pigs to the Bacon Factory continued to be satisfactory. Owing to exceptionally high prices in the south, it became profitable to send pigs from our western division to the Union, and during the year 359 were exported. A new factory for curing bacon has been erected at Marandellas. Pigs shew a falling off in numbers from 22,974 to 18,879, no doubt attributable to the enhanced price of maize as compared to that of bacon, and the consequent diminished inducement to breed and feed swine.

The number of sheep in the country at the end of the year was 367,818, an increase of 2.9 per cent. Of these, 302,701 belong to natives, and of the 65,117 held by Europeans, only 9,263 are merinos, a diminution for the year of 2,762 head, attributable to the excessive rains in the latter part of the year, which were especially heavy in the Melsetter area, where woolled sheep are mostly found.

Goats numbered 766,401, the great majority being held by natives.

With the rapidly increasing numbers of cattle, diseases of which formerly little or nothing was heard, such as quarter-evil, anthrax, fluke and contagious abortion, are now more evident, and it is unfortunate that in these times, owing to the war, our staff of Veterinary Surgeons is so much curtailed. Active measures were taken for our protection against the possibility of rinderpest invading us from the north, especially in view of the disturbed state of the country owing to the campaigns in East Africa. One of our own veterinary officers had been sent there on the first alarm, and returned after two years of this duty, whilst the Principal Veterinary Surgeon of the Union, with two members of his staff, were still engaged on the work, which is being carried out jointly on behalf of all the South African States. So far, the disease has been successfully prevented from coming south.

African Coast Fever amongst cattle has, both in the Union and in Southern Rhodesia, of late years developed a distinctive habit, which takes the form of occurrence at new centres where it has not been known, or where for many years it has not been in evidence. These outbreaks cause much alarm and uneasiness, although hitherto the progress made by the now recognised procedure in eradicating infection has been generally successful. Reasonable confidence is felt, therefore, that outbreaks can be dealt with, and that in no case will a devastating epizootic disaster occur, but none the less there remains the highly unsatisfactory fact of the possibility of recrudescence any-

where, which gives good grounds for increased watchfulness. The anxiety in the public mind has been manifest in meetings and representations, which justified the Government in appointing a committee of enquiry similar to that held seven years ago on the same subject. The reports of that body have been published, and its recommendations are in process of being dealt with, the main result being the proposal to enforce dipping, not as at present, only in districts where it has been asked for by a majority of the inhabitants, but throughout the length and breadth of the country. This step indeed is a natural development of the present system of local option, and as a general preventive step it is heartily to be welcomed. Universal compulsory dipping when applied will have far-reaching consequences. The benefit will be great, although at first some little confusion will no doubt arise from the revolution of the existing order of things, and until the tanks rendered obligatory have been provided.

The "Compulsory Dipping Ordinance, 1914," with its provisions for local option, has been adopted to an extent altogether beyond the highest hopes, and by the end of the year had been applied to 78 per cent. of the farms, and was in course of adoption to a further 20 per cent., leaving only 2 per cent. not yet affected. These figures indicate that voluntarily the greater part of the country has accepted the principle. Tanks were being erected very rapidly, the number having increased during the year from 761 to 991, whilst the public mind was being prepared for the enforcement of the law throughout the whole country, which would not have been the case had the law been harshly enforced in a manner likely to provoke opposition. The next step, compulsory dipping throughout the country, has been widely canvassed during the year, and should it, as is most probable, come into force, it will be found necessary to allow a very considerable period of grace for farmers to make the necessary preparations, as there are many practical difficulties to be overcome in arranging for the erection of tanks, and it will be impossible to get the great number of additional ones required erected simultaneously and at once.

The strict measures for the maintenance of the sanctity of our border against the passage of cattle from Bechuanaland and the Tati and Transvaal borders have been continued by means of a system of police patrols assisted by a fence. This has been regarded as necessary, in view of the continued existence of pleuro-pneumonia in Northern Bechuanaland. We are free of this disease, but those familiar with lung-sickness know it would be disastrous to our herds if it broke out amongst them now, highly susceptible as they are through long freedom. The protective steps taken appear to have put an effective end to illicit introduction of cattle, which at one time, there is reason to believe, was far from uncommon.

The payment of rewards for wild dogs was re-introduced, but the small advantage taken of this arrangement confirms the view previously reached from experience that this system, however attractive in theory, is not really very practical or effective. Rewards were claimed for only 60 dogs. Baboons are undoubtedly a serious pest, and well worth the grain growers' time to destroy. Enquiries were instituted in this and

other countries as to the best methods of extermination, and the conclusion reached that a system of surrounding by night and shooting was undoubtedly the best means, and to this end combined operations by farmers and natives are being instituted.

The total area under the principal grain grown by Europeans, and including orchards, exceeds for the first time in the history of Rhodesia a quarter of a million acres of land. This very satisfactory figure is an increase of 22.71 per cent. over the previous year, which in turn was 10.65 per cent. more than the one before it, whilst at the end of the year we know there is again a considerable extent of virgin soil broken up for next year. It therefore appears that, though the number of farmers is not increasing, and in spite of the absence of so many on war service, those who remain are far from idle, and are carrying out the economic ideal, so frequently urged in public, of increasing to the utmost our local production, even although immediate outlets are not obvious, so that as far as possible we may be independent of outside supplies, and may be ready to help to feed and provide for others as soon as transport is available. Further lessons drawn from our crop statistics are that arable farming is keeping pace with pastoral increase, that mixed farming is apparently increasing, the crop farmer giving his attention to stock, especially to dairying and cattle fattening, and the stock farmer growing more crops than formerly for his labourers, for winter feeding of stock, and also for marketing. Yet another noticeable fact is the increase in the number and variety of crops grown. Maize, which in 1916 was 86.05 per cent. of all crops, represented in 1917 only 81.57 of a much larger area. There is, therefore, both a relative and absolute increase in the area sown to other crops, indicative of a gradual adoption of the principles of rotation. The practice of growing only one single cash crop is giving way to a system of more diversified cropping and of more intensive arable farming. That it is not so much a question of chemical exhaustion of the soil by over cropping is shewn by the good returns obtained from the side crops sown on soil that has too long carried only maize. Much interest in the subject is being manifested by farmers who are applying these ideas with beneficial and far-reaching results.

Some of the figures which have already been published in detail are deserving of special repetition here. The European crops harvested covered 249,038 acres, those of natives about 1,179,912 acres, an increase of 46,092 acres and 24,327 acres respectively over last year. These figures are only approximate, as in no case is the land actually measured. The maize yield was 938,130 bags from 203,150 acres, an increase of 257,845 bags and 28,503 acres, and an average yield of 4.62 bags per acre, against 3.93, 5.47 and 3.88 for the three previous years. This average figure represents the whole country, but in the principal maize-growing districts of Mazoe and Lomagundi the average was respectively 7.9 and 5.2 bags per acre, these important areas fortunately suffering less than others from the mid-season drought. The quantity for which permits to export were given during the year was 416,376 bags; of the remainder, 153,773 bags was indicated as reserved by farmers for their own use for seed and as food for labourers and stock, leaving 490,385 bags available for our mines, towns and other local

consumption. To this last item has to be added imports of maize and maize meal equivalent to 32,207 bags, as against 26,806 in 1916, giving a local consumption (other than by natives at their kraals) of 522,572 bags. The balance of trade in our favour was therefore a net export of 384,169 bags. The maize crop was the heaviest yet recorded in Rhodesia, the previous highest being 914,926 bags in 1915.

The guaranteed minimum price assured by the Imperial Government to our farmers last year, and the subsequent purchase of considerable quantities at an even higher price, quoted anywhere on rail, exerted a most beneficial influence upon the market, which, in view of a record crop and grave doubts as to export facilities, previously had been somewhat depressed. This arrangement at once steadied prices, and thus benefited all producers, not only those who availed themselves of the scheme. Apart from maize exported by the co-operative societies and other customary commercial channels, the Imperial Government, through the British South Africa Company, directly purchased 124,397 bags, one-eighth of the total crop, at a uniform cash price of 12s. 9d. per bag at any point on the railways. The transaction worked smoothly, and this and all other maize was conveyed to the port speedily and in good time before the rainy season set in.

The position of our principal export crop is thus seen to be satisfactory, and in some respects unique. Rhodesia has already established a reputation as a country which produces maize of one uniform type only, the flat white, and that of a quality which is perhaps not to be excelled anywhere, and this position it is most desirable to maintain. Although our total contribution to the world's market may not be very great yet, Rhodesian maize is known to buyers as a definite article having special merits for certain purposes where high starch content, freedom from mixed colour, large size and vitality, impossible where kiln drying has to be practised, are in demand. Through our system of official grading, this high standard of excellence is ensured in respect of exported grain, and, in addition, uniformity, dry condition, freedom from weevil or damage and genuineness of description are guaranteed. These factors should be of cumulative value as time goes on, particularly when the markets are more discriminating than is at the moment the case.

Summer wheat shewed a notable increase from 868 acres in 1916 to 1,534 acres in 1917, and an increased return of 127 per cent. One-third of the acreage is sown in summer, in spite of risks of rust, and two-thirds on naturally moist or irrigated land in winter. The total yield amounts to about one-quarter of our total yearly requirements. The need of local production, both to ensure our own needs and to release corresponding quantities in countries whence export to Europe is possible, was urged on the farmers by the Department, whilst the means of so doing was also dealt with, and there is reason to believe that the increased production of wheat is attributable to the realisation of these facts by the growers. In certain districts rye is a more suitable crop than wheat, and generally grows better, and is coming into favour for local consumption on the farms, though sale is somewhat restricted. Similarly, buckwheat, of which a couple of crops can be raised in a

season, is becoming popular, although the same difficulty exists in realising this crop.

Ground nuts continue to hold a high place amongst our crops, next after maize, except for cattle melons, which are, of course, grown only for farm use. The acreage has gone up from 3,043 to 3,830 acres, and it is noticeable that this crop is being more widely grown than hitherto, being introduced particularly in the maize areas. The yield was 24,323 bags of 83 lbs., and, owing to the partial drought, the return was something less per acre than in previous years. A considerable amount of this crop is retained on the farm for rations and stock feed and seed, but there has been a good demand both by the Oil Factory and in the Union throughout the year.

Sunflowers would be a popular crop, being easily grown and notably beneficial to subsequent maize crops, but it is somewhat difficult to dispose of at present, though very high prices are offered for it in England. Stalks of sunflowers sent from Rhodesia were examined by the Imperial Institute for pith and paper purposes, but unfavourably reported upon. The ash from burnt stalks is now being examined as a possible source of potash.

The revival in tobacco has been maintained, but the season proved unfortunate, and the average acre yield was only 456.48 lbs. from 1,995 acres, giving a total of 910,684 lbs. of leaf, which, however, was advantageously disposed of, there being a distinct and increasing public appreciation of both the Virginian and Turkish types of Rhodesian tobacco. The outlook at present as regards tobacco is distinctly encouraging and deserving of attention as a profitable line of farming, very different to the position four years ago.

A number of minor crops are now also being grown. Putting it in round numbers, we have approximately the following interesting figures :—

	Acres.
Maize	200,000
Maize for silage	10,000
Pumpkins and cattle melons	9,000
Wheat	4,600
Ground nuts	3,800
Beans	3,000
Potatoes	2,500
Teff	2,000
Tobacco	2,000
Oats	1,800
Kaffir corn	1,600
Sunflower	1,000
Napier fodder	750
Millets (manna)	750

The citrus fruit industry promises ere long to assume very considerable dimensions. Already statistical returns shew 37,799 orange trees in bearing and 78,484 not yet arrived at that stage, a total of 116,283 orange trees together, with 20,626 lemon trees and 12,520 trees of other

citrus varieties. Export must ere long become a serious problem. Hitherto we have, by courtesy, been allowed to enjoy the facilities specially accorded under the mail contract to citrus growers in the Union, but this may not be available in the future. This year all export was suspended, but a considerable quantity found a ready sale to native employees on the mines. There may be some difficulty in securing markets at first, but in this connection it is comforting and encouraging to know that the most competent authorities engaged in the trade describe the quality of Rhodesian oranges as of the very highest, so that, if the present standard of care in grading and packing for export is maintained, we may depend upon the active sympathy of buyers to assist us in securing outlets when normal conditions return. The chief citrus growing areas at present are Mazoe, Lomagundi, Salisbury, Umtali and Makoni, but Hartley and Marandellas districts are also active in this direction. It is pleasing to note that the Citrus Adviser also reports having examined certain localities, in which citrus fruits are but little grown as yet, and found them admirably suited for the purpose, so that a considerable further extension of this industry is possible in the future.

(To be continued.)

Prospects of the Tobacco Crop.

In spite of all the fears expressed during the continuance of the rains, there is reason to hope that this year's tobacco crop will shew an improvement over last, and thus continue the steady progress which has marked the past two seasons. The acreage reported as put down to this crop is 3,510, the highest since 1914, an increase of 76 per cent. over the season 1916-17. There can be little doubt that the total weight of leaf to be gathered will much exceed last year's crop. If the yield per acre is put far below the average for the previous four seasons, the harvest will be over one and a quarter million pounds, and may reach one and a half million pounds. We are justified in the belief that the near future will see the tobacco industry restored to its old position of prosperity and importance.

Report on Experiments in Fruit and Forestry

AT THE RHODES ESTATE, INYANGA.

By J. W. Barnes.

The fruit trees grown on this estate are mostly deciduous, viz., apples, pears, plums, peaches and apricots, of which the most important in a commercial sense are the apples and pears. Twenty-one varieties of the former and six of the latter have had a good trial. The best five varieties of apples are Munroe's Favourite, Rhode Island Greening, Scarlet Nonpareil, Cleopatra and Rome Beauty.

The following list, with remarks, may be of interest:—

APPLES.

Munroe's Favourite (or Chenimuri), Rhode Island Greening and Scarlet Nonpareil are very free of disease, and good bearers.

Cleopatra is a good bearer. Small percentage bitter pit.

Rome Beauty is a good bearer. Fruit fly is very fond of this apple.

White Winter Pearmain.—Good bearer. Tree cannot stand the sun, which blisters it very much. Tree should be kept whitewashed with lime.

King of Pippins.—Very fair. Subject to watercore.

Blenheim Orange.—Enormous bearer. Watercore and brown rot spoil about half of every crop.

Lord Wolseley.—Good bearer. The most crisp and juicy apple grown here. Watercore slightly, and black spots appear after picking.

Yellow Bellflower.—Very handsome fruit. Fair bearer, inclined to pit.

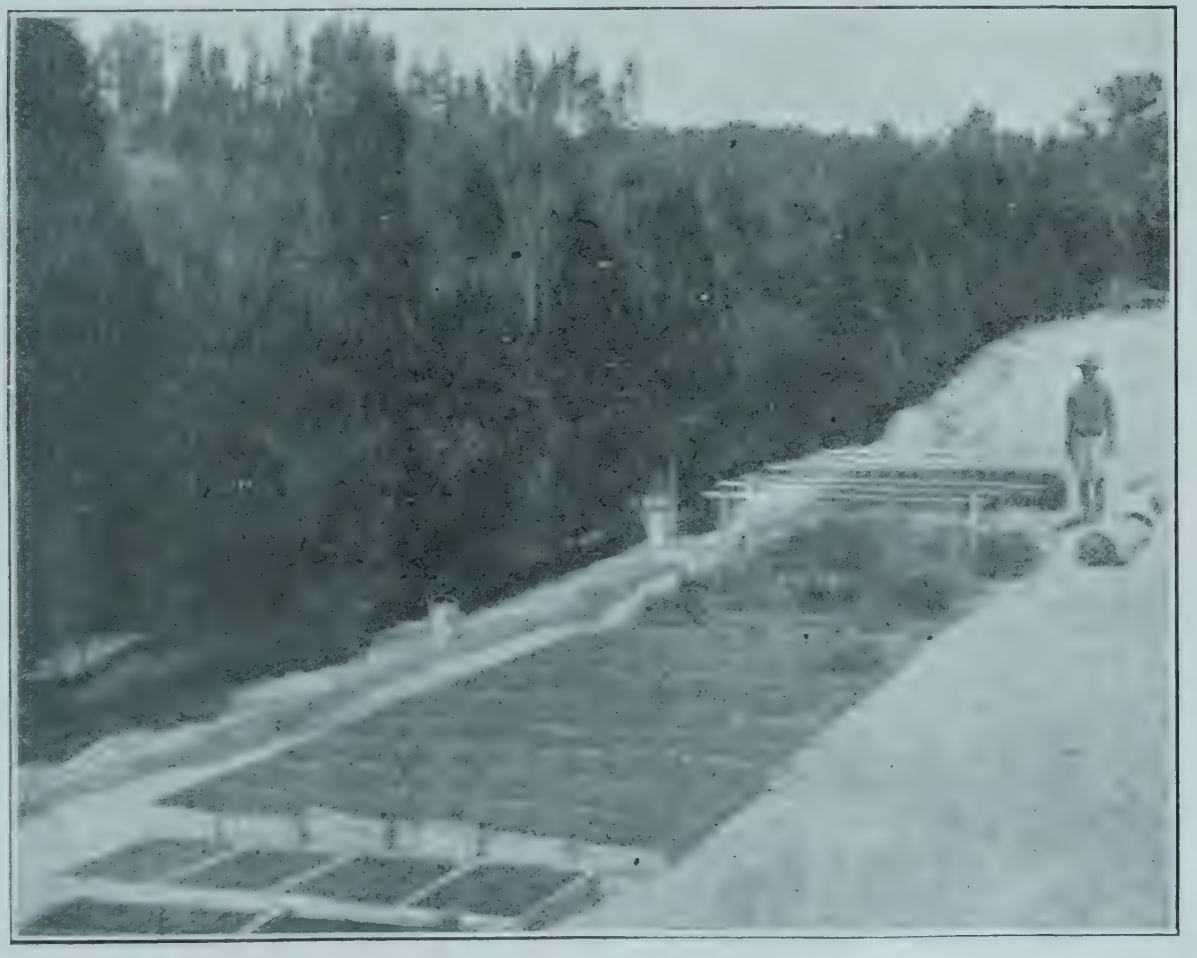
Jonathan.—Bears well, but too small here for market.

French Crab.—Bears well. Sound market apple; second rate quality.

Warner's King.—Bears well, apples weighing up to 2 lbs. This apple develops large black spots, generally after packing, which go right through the fruit, spoiling it completely.

Syke House Russet.—Splendid russet apple of finest flavour. Large percentage too small to market, and some years poor bearer.

Rhodes Estate. Inyanga. Eucalyptus saligna. Photo by Mr. J. W. Barnes.



Rhodes Estate, Inyanga. Forestry Nursery. Photo by Mr. J. W. Barnes.

Rhodes Estate, Inyanga. **Bottom Orchard.** Photo by Mr. J. W. Barnes.

Rhode Island Greening Apple Tree.
Rhodes Estate, Inyanga. Photo by Mr. J. W. Barnes.

Nickajack.—Fair bearer and late, being so late that most of the fruit is spoilt by fruit fly.

One variety, name unknown, probably Rokewood, good bearer, good quality.

Red Astrachan.—Good bearer. Very early, sometimes ready for Christmas market; mealy flavour, poor traveller.

Ribstone Pippin, Celini, Cliff's Seedling and one unknown.—These are failures.

A few other varieties are being tried: Rokewood, Reinette du Canada, Smith's Cider, York Imperial, Yellow Newton Pippin and Watsonville Special.

PEARS.

Bon Chretion.—The best pear. Bears well, and of best quality; must be picked quite green; a safe rule to pick as soon as fully grown and not wait till they shew colour.

Jarginelle.—Heavy bearer of good quality. Must be picked when beginning to turn yellow; will not keep after ripening.

Louise Benne De Jersey.—Bears well, but poor quality. Have tried picking at several stages of ripening, but failed to get fruit worth eating.

Keiffer Hybrid.—Fair bearer and large fruit. Must be picked quite yellow, and is a good traveller.

Fertility.—Has failed here.

Vicar of Winkfield.—Cooking pear, shy bearer. Good hard fruit of nice red colour; will travel well.

Glou Morceaw.—Only now commencing to bear; very promising.

Easter Beurre.—Just beginning to bear; very large fruit; late; very promising.

Calabasse Grosse.—Enormous fruit, weighing up to 3 lbs.; very ornamental.

STONE FRUIT.

Plums, peaches and apricots all do well, and there is no reason why plums such as Burbank should not be grown and marketed from this estate. Peaches and apricots would not stand the wagon journey to the railway. A few cherries are also being tried, but it is too soon yet to say how they will do.

PLANTING.

All fruit trees are planted 20 x 20 feet apart, and orchards are ploughed and cultivated. All young trees have been planted without manure, but this is a mistake in this poor soil, and any more that are planted should have manure, for it makes all the difference between failure and success.

Over 2,000 apples have been planted during the last four years, the ground having been thoroughly prepared beforehand, ploughed and

cultivated as deeply as possible, afterwards harrowed, and all rubbish, weeds, etc., burnt. To peg out orchard, a planting wire was made as described by Claude Fuller in "A Fruit Grower's Handiwork," and, with a planting board or tree setter, is a very accurate way of laying out an orchard. The planting wire is made by taking a roll of No. 12 white wire, and after fixing a ring to one end, a peg is inserted into it and driven into the ground. Run the wire out to the required length, fixing another ring as before, draw tight and peg down. Measure, and at every 20 feet clean wire with sandpaper, roll a piece of No. 20 copper wire around two or three times and solder on. The planting board is made from a piece of flooring board, 6 feet long, with three notches cut into it, one in centre and one 6 inches from each end; each notch should be $1\frac{1}{2}$ inches deep and cut as a **V**. In use, the board is laid along the wire, with the solder mark opposite the centre notch, three pegs being driven into the notches. When planting, the board is laid with the two outside pegs fitting into the notches, and the tree stands in the centre notch. Providing the outside pegs have not been moved, the trees are certain to be accurate.

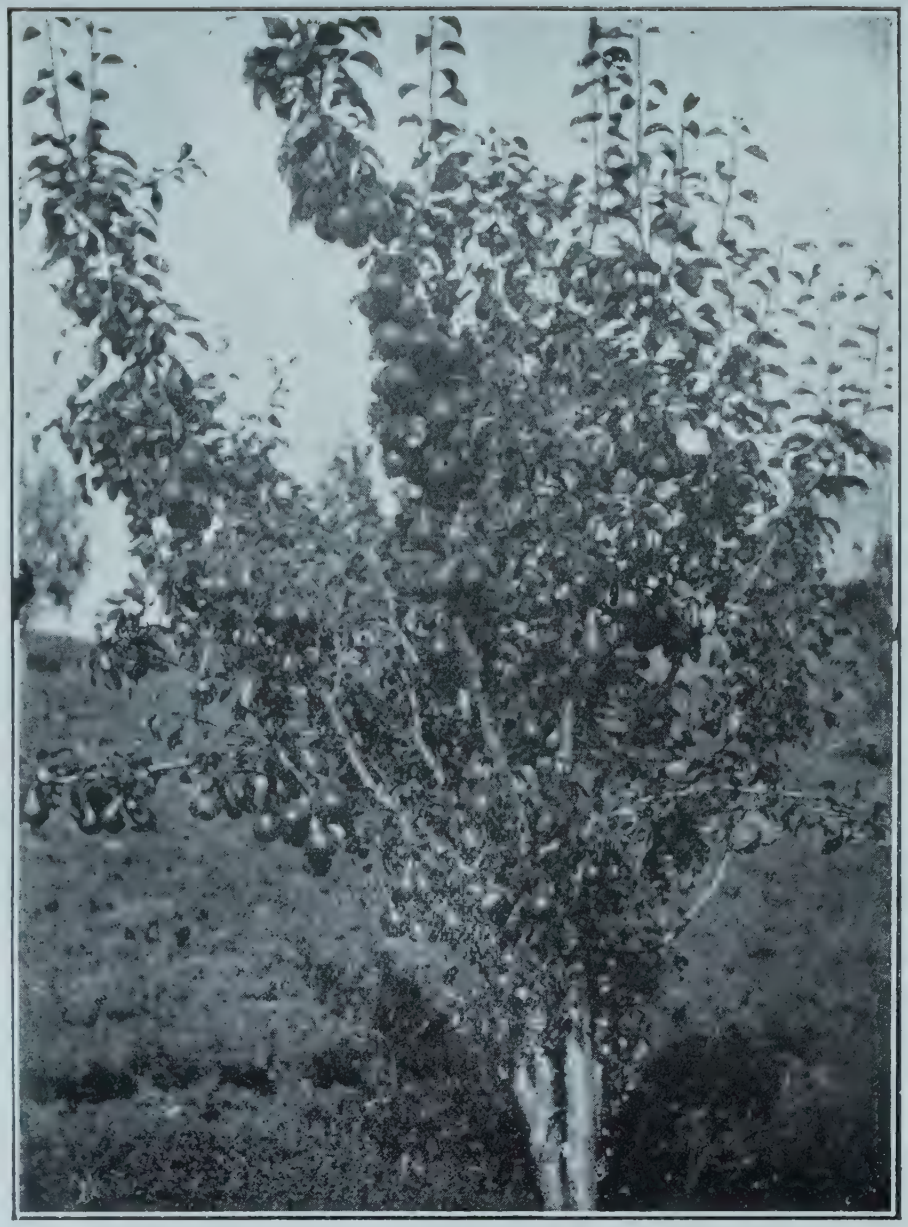
One thousand holes were prepared with dynamite, but this is quite unnecessary here, as there is no hardpan, and there was no difference between the growth of trees treated and those planted in the ordinary way. Dynamite was also tried around a few old plum trees growing in very hard soil, but there is not the slightest difference, although the experiment was tried two years ago. The dynamite was used in the way recommended by the makers.

All trees have been sprayed each winter with Bordeaux Mixture 8-8-50. There is not much disease here—a little scab and brown rot; and white mildew has made its appearance these last two years, which is being treated with lime sulphur this year. By far the most damage to the fruit is caused by the fruit fly, which stings a large amount of fruit every year. The fruit rots very quickly for about a quarter of an inch around these stings, making it quite unfit for market. The poison bait for fly would not be much good here, on account of the very wet weather we usually have during the apple season. Special tins to fasten on to the trees, to hold a little paraffin, have been used to catch the flies, but on account of high winds some of the paraffin was shaken out on to the branches and killed them. The use of traps has been discontinued, as they did not appear to catch many flies.

FORESTRY.

From 1912 to February, 1917, 45,705 trees were raised and planted, consisting of Eucalyptus 29,434, Cupressus 15,514 and other trees 757, occupying altogether $37\frac{1}{2}$ acres.

Varieties of Eucalyptus.—Globulus, Pilularis, Resinifera, Bicolor, Crebra, Rostrata, Robusta, Diversicolor, Microcorys, Redunca, Punctata, Saligna, Tereticornis, Coreacia, Seiberiana, Citriodora, Ficifolia, Paniculata. With the exception of Seiberiana, Bicolor and Crebra, all these varieties do well, the only varieties touched by frost being Citriodora, Pilularis and Ficifolia. Globulus, Pilularis, Pani-



Louise Bonne de Jersey Pear Tree.
Rhodes Estate, Inyanga. Photo by Mr. J. W. Barnes.

Pear Trees.
Rhodes Estate, Inyanga. Photo by Mr. J. W. Barnes.

Fruit in Packing House.

Rhodes Estate, Inyanga. Photo by Mr. J. W. Barnes.

APPLES
APPLES
APPLES

culata and Saligna are probably the best, very quick growing, and average 20 feet height two years after planting. Coreacia is not a timber tree, but would make a very fast and handsome hedge shrub.

Cupressus.—The main cypress grown here is Cupressus goveniana. This is by far the best cypress tried, is easy to raise, and very quick growing.

C. lusitanica, almost as fast as goveniana; C. elegans, a failure; C. macrocarpa, fair growth; C. thimfern, fair growth; C. torulosa, very slow; C. horizontalis, fair growth; C. pyramidalis, fair growth.

Pinis insignis, a very fast grower; P. pinaster, fairly fast; P. halepensis, slow; P. canareinsis and P. pinea are slow and not worth growing.

Callitris calcarata and C. robusta, Casuarina leptoclada and C. quadrivalvis make good growth and are ornamental.

Cryptomeria japonica grows well and is very ornamental.

Thuya orientalis, slow.

Juniperus virginiana, slow.

Acacia baileyana, very fast and ornamental.

Greyvillea robusta, very good.

All trees are raised from seed in a reed house, seed being sown in tins, and later pricked out into tins and boxes. Fine soil is used for seed tins, one barrow soil, half barrow sand; and for pricking out into tins, one barrow soil, half sand and quarter well-rotted manure. The manure does not require to be too fine, but should go through a quarter inch sieve. Rough stable litter is used as drainage, which rots as the trees grow, and acts as further manure to help them on when they begin to get root-bound. After pricking out, the seedlings are left in the shade of reed house for one week, then transferred to the sunlight, and placed on level floors prepared for them, giving the tins plenty of room, so as to get as sturdy a tree as possible. All tins are looked at once a week, and roots coming through the bottom are scraped off.

The best time to sow seed here is: gums, from March to end of April and again in August and September; blue gums can be sown a month later, as they grow so quickly; if sown too soon, they get too big by the time the rains come. Cypress and pines can be sown in November and December, and pricked out in February and March, so as to get them established in time before the winter. Pines should be allowed to grow a foot or eighteen inches high before planting out; those less than nine inches do not transplant at all well.

The land for trees is fallowed a year before it is required, and in the spring it is re-ploughed and harrowed as deeply as possible. A wire similar to that used for fruit is used for planting, but with the solder marks at every six feet. Two boys use this wire, and take out a little soil with a hoe at each mark, while another boy drops one tree into each hole. Over 2,000 trees can be planted per day with four boys. Trees are always planted during rain, when they need no more attention till the winter, when plantations are cleaned.

There have also been established nine acres of blue gum, Eucalyptus globulus, *in situ*, the soil being prepared as for planting, but harrowed to a fine tilth, seed sown in lines six feet apart with a Planet J. drill, the roller and seed furrow fillers having been removed. Great care must be taken that the seed is not sown deeper than half an inch, and no attempt should be made to cover the seed, as the first rain will do this best. Seed is sown at the rate of 2 lbs. per acre. The plantations should be thinned out during the first or second winter, the second year being the best, as a certain number get killed by white ants the first year, but seem to be left alone as they get older. *In situ* sowing has been a great success.

Pinus pinaster was also tried *in situ*, but, after germinating well, died out the second year for no apparent reason.

Wattle.—Two varieties have been grown, Acacia mollissima and Acacia dealbata. The former is the black wattle, and much the better tree. Dealbata germinates very easily, but makes poor growth compared with mollissima. Nearly all wattle was sown broadcast, principally as shelter belts for stock, etc., and was sown at the rate of 15 lbs. per acre; 10 lbs. is not enough for mollissima, although it is ample for dealbata.

If wattle is to be grown for bark, it should be sown in lines, so that it could be thinned out quickly and easily when large enough, as it is practically impossible to thin out large acreages sown broadcast. The ground for wattle is ploughed and fallowed as for other trees, disced and harrowed well in the spring, and sown in December and January. They do not grow much the first year, but shoot up very rapidly the second.

The conditions at Inyanga are very favourable to tree growth, for although the soil is very poor for ordinary farm crops, there is a variety of soil, and most of the trees are growing in a heavy loamy clay. The rainfall is over 30 inches, and the heavy mists experienced during the winter months are conducive to good tree growth.

The Maize Crop, 1918.

PRELIMINARY FORECAST.

The first preliminary forecast of the maize crop for this season is 794,549 bags from 213,244 acres. Absolute precision in such a forecast being impossible without prophetic powers, it will be sufficient to put the figure at 800,000 bags, thus allowing about 300,000 bags for export. The return per acre will, it is expected, be considerably less than last year.

In the preparation of the above forecast the average returns for every district during the past four years have been separately considered, coupled with reports from leading farmers, Native Commissioners and other competent informants as to the prospects at date. The acreage of 213,244 acres is that given by the farmers at 31st December, 1917, as sown to maize for grain, an increase of 10,094 acres, or close on 5 per cent. over last year's figures, shewing that our efforts to produce as much as possible are, in spite of difficulties, very well maintained. Maize sown expressly for silage is excluded.

This year the returns depend not so much on locality, for the season was excessively wet everywhere, as upon the particular class of soil cultivated. Generally speaking, on red soil the yield varies from as good or better than last year down to a two-thirds crop, whilst on the sand veld it varies from a total failure up to about half of what such land yields in a good season, which is at any time much below the yield in the red soil.

Our corresponding forecast at the commencement of last season was within 2 per cent. of the eventual crop. Owing to uncertainties due to the weather, an equal degree of accuracy is not to be anticipated this season, in which it has been peculiarly difficult to frame estimates with much confidence.

Revision of these figures is contemplated when the harvest is well advanced and farmers know how their crops are turning out.

It will be of interest to producers to learn the acreages planted to maize for grain in the principal districts. Mazoe returns 59,716 acres, as against 52,915 last year and 42,939 the season before that. This district is responsible for nearly half of our expected crop, and fortunately suffered very much less than other districts in which maize is less largely grown. Second comes Salisbury district with 42,172 acres, then Hartley with 22,117, Lomagundi 16,440 and Gwelo 14,263 acres. No other district approaches 10,000, the nearest being Makoni, with 6,917 acres. These districts occupied the same relative positions for maize last season.

Stock Records

FOR RANCHES IN RHODESIA.

By Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.

The system of keeping considerable numbers of cattle under natural and free conditions is known in Rhodesia as ranching, though not strictly agreeing with the term as used in other countries. The practices of dipping, herding and kraaling at night often, though not always necessary with us, have led to the evolution of our own methods of management, and to ideas on the subject of cattle raising rather different from those in the cattle runs of America or Australia. Consequently also our methods of recording vital statistics and financial data affecting our stock are to some extent the result of our peculiar system and our conditions.

Through the courtesy of several larger ranchers, the writer has been shewn their various methods of recording the progress and history of their herds, and of periodically calculating the financial position of their undertakings. Whilst all such statements have a family resemblance in that they deal with the same subject, yet no two examined have been precisely alike in form and matter, varying according to the special needs of the undertaking, the size of the ranch, the management, whether personal or through managers, and the degree of detail held to be desirable. This will always be so, and the form now submitted as a model must be only regarded as a sample or type to be adjusted to meet special requirements, not necessarily as a perfect and universal plan to be slavishly followed. No claims of great originality are made for the accompanying forms, which have been freely borrowed from those referred to above, but in their final shape resemble none very closely, but are rather more complete and at the same time more condensed than the originals. Before venturing to publish them here, they have been regularly used for some time on a ranch carrying at the moment 1,200 head of cattle and 1,800 sheep, and have been found to work smoothly and easily. Monthly returns are framed and sent in by the manager, and a simple and accurate statement of the precise position and any changes during the period covered are seen at a glance. For subsequent reference, and to shew the results of management and to assist in making further plans and framing forecasts, these tables are found to be most useful.

CATTLE.

The forms here dealt with are three in number, two monthly and one annual. Taking that marked "A" first, it will be found to consist

of a monthly, or, if preferred, a quarterly statement of increases, decreases and transfers from one class to another, as when calves come to be regarded as steers and heifers, or heifers become cows. The cattle are here classified into seven such categories, but on large ranches a column for each year's steers might be required or other differences introduced. The first horizontal line provides for the numbers carried over from the previous month or quarter. Beneath this all increases in each class are recorded, whether by birth, purchase or transfer from a different class. The sum of these gives a gross total from which deductions have to be made. Decreases are recorded in a similar way according to the cause, natural death, slaughter, sale or transfer, the latter being equivalent to the increases by transfer above. The total of these four lines subtracted from the gross increases gives the net increase or decrease in each class at the end of the period.

The form marked "B" deals with the causes of death, and enables a check thereon to be kept. A certain mortality is expected, but one of the objects of good management is to keep this as low as possible. This table, when compiled for several seasons, will indicate the prevalence of a particular malady, against which measures may be taken. Should the item "unknown disease" be specially heavy, there will be cause for veterinary enquiry. Prevalence of redwater or gall-sickness may throw doubts on the efficacy of the dipping. Heavy loss from internal parasites would point to a need for dosing, or for avoiding certain pastures at particular seasons, and so on. Seasonal mortality too may be observed, and in future years precautions taken at the appropriate time. In vertical columns the causes of deaths are detailed for all the stock, for unbranded calves and for "adults," a rather loose term embracing all cattle other than unbranded calves. The percentage column will only be used when very large numbers are involved or exceptionally heavy mortality has been recorded, for it is to be hoped that the deaths during any one month and under any one of the twenty-four possible causes will not be so heavy as to form a serious percentage of the whole herd.

The annual statement marked "C" gives a summary of the year's developments and transactions, and the average results which are of prime importance for a comprehensive review of the position. Since the number of stock varies from month to month during the year, the only fair basis to work out certain of the figures upon is the "monthly average," that is, the sum of the total numbers recorded each month divided by twelve. This is not of interest as regards the percentage of cows calved, which should be given in respect of the actual number which might have calved, nor to the number of calves which is dependent thereon. As regards other increases or decreases in numbers, it is, however, interesting to see both the absolute figure and the ratio it bears to the monthly average of cattle. The final figure of increase or decrease is, of course, the crux of the whole problem. Over a period of years these figures will prove very instructive, and any aberration from the normal will attract attention to matters which may require explanation.

The annual statement consists of a summary of increases and decreases, followed by an enumeration or analysis of the stock and a

valuation. After the numbers and value a year before have been shewn and the monthly average number recorded, a tabular statement shews the number of cows that calved and the number of calves surviving at date. As in the monthly statements and derived from them, the year's increases by birth or purchase are first recorded and added together as gross increase. In a similar fashion, all forms of decrease are shewn and added together as the gross decrease, and the difference of these two elements is the net increase. Decreases by death are shewn separately for stock over and under one year of age, to bring out the calf and adult mortality—an important point. The actual or absolute figures are given in one column, and where applicable in a parallel column the figure is given as a ratio of a common denominator, that is, as a percentage of the monthly average number.

This tabulation is followed by another, the annual enumeration and valuation of cattle, taken from the final items in the return for the last month of the calendar or financial year. The same categories of stock are shewn, or may, as seen in the blank form "C," be extended in more detail, or varied to suit the needs of any particular case. With these appear their valuations, which, in the case of animals not intended for immediate sale, are somewhat arbitrary.

In the forms "C" and "F" the date "1st January" is shewn, but any other date is equally appropriate. All sheets should bear the signature at the bottom of the owner or manager, as the case may be.

SHEEP.

Precisely the same system has been applied to sheep, and need not therefore be explained, except in regard to the details of classification and the list of ailments.

Table "D" for sheep corresponds to Table "A" for cattle, the elements for increases and decreases being precisely the same, whilst the categories for the stock are appropriately altered, and again are subject to the discretion of the owner. Table "E" is the equivalent of Table "B" for cattle, the diseases being appropriately altered. The annual statement and valuation for sheep shewn in Table "F" follows that of cattle *mutatis mutandis*.

Book-keeping for farmers is frequently advocated by those who are not farmers. They usually recommend systems of double-entry, of ledgers and day books and sub-division of branches of the farming operations, as if they were as separate and distinguishable as are departments in a universal provider's store. This is not so, and to debit crops and credit oxen is as fantastic as it would in ethics be to credit cherubim and debit the other side. There is, however, let us grant, much room for a more careful record of transactions by the farmer than is to-day usually the case, whereby he may ascertain the profitability of different sides of his work, but this is to be obtained more by such records as the above, by milk tests of his dairy herd, by careful weighing of average sample areas of his crops and calculation of the costs of production, than by a pettifogging attempt to apply the methods of the huckster to almighty nature.

"A."

MONTHLY CATTLE RETURNS.

.....ESTATE. ANALYSIS FOR.....19...

	Stud Bulls.	Cows.	Heifers.	Unweaned Calves.	Steers, all ages.	Trained Oxen.	Bulls for sale.	Total.
Total for previous month								
Increase by birth ...								
Increase by purchase ...								
Increase in class by transfer								
Decrease by death ...								
Decrease by slaughter ...								
Decrease by sale ...								
Decrease in class by transfer								
Deduct total decreases...								
Total remaining on								

NOTES :—

.....Manager.

"B."

MONTHLY CATTLE RETURNS.

.....Estate. Mortality for Month of.....19...

Cause of Death.	Totals.			Percentage on Monthly Total.	Remarks.
	Adults.	Unbranded Calves.	All Ages.		
Redwater ...					
Anæmia ...					
Gall					
Stomach ...					
Lungs					
Tumours ...					
Intestinal Parasites					
Fluke					
Snake Bite ...					
Other Diseases ...					
Unknown Disease ...					
Calving ...					
Rejected by Dam ...					
Weaklings ...					
Castration ...					
Drowned or Bogged					
Injuries ...					
Poison (chemical) ...					
Poison (veld) ...					
Carnivora ...					
Poverty ...					
Old Age ...					
Destroyed for Reasons					
Lost or Stolen ...					
Slaughtered for Consumption					
Total for Month					

.....Manager.

"C."

ANNUAL CATTLE RETURNS

.....Estate. As at 1st January, 19...

Grand total at preceding 1st January.....head.
Valuation at preceding 1st January.....
Monthly average number for the whole year.....head.

	Total.	Percentage.
Cows calved		of total cows
Natural Increase—calves survived on 1st January		,, ,,
Increase by purchase		of monthly average herd
Gross Increase		,, ,,
Decrease by death of branded stock (over twelve months)		,, ,,
Decrease by death of unbranded stock (under twelve months)		,, ,,
Total Decrease by death		,, ,,
Decrease by sales		,, ,,
Decrease by slaughter		,,
Gross Decrease		,
Net Increase or Decrease		,, ,,

Enumeration and Valuation.

Classification.	Number.	Average Value.	Total Value.	Remarks
Stud bulls				
Cows				
Heifers 2 years and over				
,, yearlings ...				
Calves (unweaned) ...				
Trained Oxen ...				
Steers, yearlings ...				
,, 2 years ...				
,, 3 ,, ...				
,, 4 ,, and over				
Bulls for sale ...				
Grand Totals				

Values of bulls and other special animals to be furnished individually in a separate note.

.....Manager.

"D."

MONTHLY SHEEP RETURNS.

.....ESTATE. ANALYSIS FOR.....

	Stud Rams.	Ewes.	Lambs.	Wethers, all ages.	Cast Ewes.	Rams for sale.	Total.	Remarks.
Total for previous month								
Increases—								
Increase by lambing ...								
Increase by purchase ...								
Increase in class by transfer								
Decreases—								
Decrease by death ...								
Decrease by slaughter ...								
Decrease by sale ...								
Decrease in class by transfer								
Deduct total decrease ...								
Total remaining on								

NOTES :—

.....Manager.

"E."

MONTHLY SHEEP RETURNS.

.....Estate. Mortality for Month of.....19...

Cause of Death.	Totals.			Percentage on Monthly Total.	Remarks.
	Adults.	Lambs.	All Ages.		
Intestinal Parasites					
Liver Fluke ...					
Scab					
Blue Tongue ...					
Nasal Catarrh ...					
Lungs					
Gall Sickness ...					
Stomach Troubles					
Snake Bite ...					
Other Diseases ...					
Unknown Disease					
Lambing ...					
Rejection by Dam					
Weaklings ...					
Castration ...					
Injuries ...					
Poison (chemical)					
Poison (veld) ...					
Carnivora ...					
Drowned or Bogged					
Poverty ...					
Old Age ...					
Destroyed for reasons					
Lost or Stolen ...					
Slaughtered for consumption					
Total for Month					

.....Manager.

"F."

ANNUAL SHEEP RETURN

.....Estate. At 1st January, 19...

Grand total at preceding 1st January.....head.
Valuation at preceding 1st January.....
Monthly average number for the whole year.....head.

	Total.	Percentage.
Ewes lambed		of total ewes
Natural Increase—lambs survived at 1st January		,, ,,
Increase by purchase		of monthly average flock
Gross Increase		,, ,,
Decrease by death of weaned stock ...		,, ,,
Decrease by death of unweaned lambs ...		,, ,,
Total Decrease by death		,, ,,
Decrease by sales		,, ,,
Decrease by slaughter		,, ,,
Gross Decrease		,, ,,
Net Increase or Decrease		,, ,,

Enumeration and Valuation.

Classification.	Number.	Average Value.	Total Value.	Remarks.
Stud Rams ...				
Ewes				
Ewe Hoggets ...				
Lambs				
Wethers				
Rams for sale ...				
Grand Totals				

.....Manager.

The Duty of Water for Irrigation.

The Agricultural Engineer is desirous of obtaining information on the above subject as it applies to the Territory of Southern Rhodesia.

By the term "duty" is meant the relation between the volume of water and the area of crop it serves. The "base" of the "duty" is the time during which the flow is continued. Thus, supposing a crop requires a 3 inch watering every 15 days, then a flow of 1 cubic foot per second (equal to 539,136 gallons per 24 hours) running continuously could water an area of 120 acres in this period. In this case the duty would be 120 acres per cubic second to the base of 15 days. No definite data based on actual practice in this country exist at present, and the duty is usually assumed at 100 to 120 acres of irrigated land per cubic foot per second, varying with the crop and nature of soil, etc. This figure is founded on experience gained in other countries which have similar conditions to our own.

If farmers who at present are working lands under irrigation will keep during the coming season a few careful notes of the flow of water used at each irrigation, and the time for which it is applied to a certain area of crop, and will communicate their figures at the end of the season in the form given below, then some useful data may be obtained.

Area of land under observation, in acres.	Nature of soil.	Crop.	Date sown.	Date of each irrigation.	Measured flow of water.	Number of hours each irrigation.	Date of reaping crops.
				1. 2. 3. 4. Etc.			

The amount of rainfall during the period concerned should be noted and sent in with statement.

The information, when completed, should be sent to the Agricultural Engineer, Department of Agriculture, Salisbury, who will utilise it for general information.

Note.—The following Bulletin issued by this Department explains how to measure the flow of water in a furrow:—No. 64, February, 1911, "Hints on Irrigation," by W. M. Watt.

Contagious Abortion in Cattle.

By Sir Arnold Theiler, K.C.M.G.,
Director of Veterinary Research, the Union of South Africa.

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IDENTIFICATION OF THE DISEASE.

Since the discovery of the causal organism of contagious abortion the disease has formed the subject of much experimental research both in Europe and America. Its presence in South Africa has been known for a considerable time, having given rise to great losses, but its identity with the European disease was only demonstrated a few years ago at the Onderstepoort Laboratory, it having been found that the causal organisms in our disease correspond in every respect with that of Europe. Since then investigations were continued at the Laboratory, and much useful information has been collected which has put us in a position to discuss, with the necessary critical reserve, the publications made abroad, some of which we are not able to support, whilst others we can endorse entirely. In this paper it is my intention to review the present knowledge in the light of our own experience resulting from our own research work. This work has been carried out by three of my present assistants—by Mr. Viljoen and Dr. Veglia in the beginning and by Mr. Robinson during the last three years. A detailed account by the latter will shortly be published in the next report of the Director of Veterinary Research.

DEFINITION OF ABORTION.

Under abortion we understand the expulsion of the young animal during any time of pregnancy of the mother, generally before it has reached the mature stage in which the normal birth takes place. Such an immature animal is called a foetus. Its evolution takes place in the uterus of the mother, in the course of which certain envelopes are formed —the foetal envelopes—which serve both for the protection and the nutrition of the foetus. The foetal membrane which comes into immediate contact with the mother animal is called the chorion; it is the external envelope and is spread along the uterine wall. At certain places of the chorion called the foetal cotyledons, corresponding with certain places of the uterus wall, called uterine cotyledons or caruncels, an intimate contact takes place and the placenta is formed, of which we distinguish a foetal and a maternal one. Here the chorion sends tuft-like villi into the uterine wall, where they come in close contact

with the bloodstream, and an exchange of nutriments takes place. It must be well understood, there is no direct communication of blood between foetus and mother: the two systems are separated by definite walls, and all exchanges must take place through them. At the time of birth a separation between the foetal and uterine placentae occurs simply by the withdrawal of the chorion villi from the uterine cotyledons. The foetal membranes are known as the afterbirth.

THE CAUSE OF CONTAGIOUS ABORTION AND THE LESIONS AND SYMPTOMS PRODUCED.

Whilst such a detachment may be caused by a multitude of non-specific causes, in contagious abortion it is brought about by the presence of a specific organism, a bacterium, called the bacillus abortus. It must be made clear that the abortion is not the disease itself: it is one of the sequels to which the disease is leading, thus only a symptom. At the present time a certain controversy exists, whether the disease which is caused by the presence of the bacillus is one of the foetus or one of the mother; lesions are found both in the mother and the foetus. We consider it to be a disease of the mother. These lesions consist in the presence of an exudate in varying quantities between chorion and uterine mucous membrane, consisting of a grey-brown mucous, odourless liquid mixed with flakes of pus. It is the product of an inflammatory process which is present in the placentae and the traces of which can readily be seen on the cotyledons of the afterbirth which become discoloured by superficial necrosis and deposits of inflammatory products, whilst the chorion itself is thickened by gelatinous infiltration either totally or in parts. The maternal cotyledons likewise are in a high state of inflammation, deeply reddened, the separation of the placenta taking place in some cases comparatively easily; in other, however, adherences are formed, which can lead to an acute or chronic metritis and subsequent sterility of the cow.

As already stated, the foetus likewise shews morbid changes; the most commonly found lesion is that of an inflammation of the fourth stomach and frequently of the intestines, indicated by reddened swellings and the presence of mucous—haemorrhagic—purulent exudate in smaller or greater quantities. Also in the subcutis in the greater number of cases, particularly in the dependent parts of the body, are found haemorrhagic-gelatinous infiltrations and sometimes collections of liquid in the peritoneal cavity.

The symptoms caused by these pathological conditions I need not give in detail; they shew nothing typical which differentiates clinically contagious abortion from any other abortion caused by non-specific agencies. It may be remembered, however, that generally speaking the disease interferes but little with the general health of the mother.

The bacillus abortus is usually present in the uterine exudate, in the diseased portions of the foetal membranes, and in the stomach and intestines of the foetus. In the majority of cases it is present in pure culture. It is also found in other lesions, but there the presence is somewhat inconstant.

THE DIAGNOSIS OF THE DISEASE.

The clinical symptoms having no pathognomic value, with perhaps the exception of an odourless discharge preceding the abortion and the fibrinous purulent exudate on the foetal membranes, which, however, are mostly overlooked or altogether missed, owing to the usual disappearance of the afterbirth, reliance on a definite diagnosis can only be placed by the demonstration of the presence of the causal bacillus. In research work this is the only certain way. Fortunately contagious abortion lends itself to accurate diagnosis through a number of procedures all based on the presence of the bacillus, which at the present time are largely utilised.

The simplest way is to demonstrate the bacillus abortus under the microscope. For this purpose smears are made from the exudate obtained from the vaginal discharge or from the foetal placenta. The recognition of the bacillus is possible when fresh material has been collected before any or at least much contamination has taken place; it is difficult and becomes impossible when a secondary accidental flora of bacteria has invaded the vagina and foetal membranes, which finally obscures or crowds out the bacillus abortus.

In 1911 some scientists of the Bureau of Animal Industry of the U.S.A., viz., Schroeder, Cotton, Mohler and Traum, shewed that when material containing abortus bacilli is injected into the peritoneal cavity of a guinea-pig, peculiar lesions are produced in some of the internal organs, particularly in the spleen, which becomes much enlarged and which contains the bacillus abortus. The enlargement is due to the formation of certain cells called epitheloid cells and giant cells, and thus resemble somewhat tuberculosis, to which the Americans have first drawn attention. It may be called a granulation tumour specific for the abortion bacillus. For the purpose of the practice this method would be too slow in its results, since a number of weeks, at least six, must elapse before the lesions are pronounced. In the elucidation of the secretion of the bacillus by the udder of the cow, where the observation was made first, it plays, however, a very important role, as will be shewn later.

THE AGGLUTINATION.

Diagnosis by agglutination is now the procedure adopted by preference. It is a specific reaction between the serum of the infected animal and the abortus bacilli. A suspension of the latter shewing a turbid appearance will clear up when serum is added in dilute proportions, the bacilli clumping together and precipitating to the bottom of the test-tube. The serum is diluted in various proportions, and it has been found that in some cases it may be active in the extreme dilution of 1 to 10,000 and more, thus shewing its specificity. Since, however, not all infected animals produce an equally active serum, and the serum of certain not infected animals may have a slight non-specific activity, it was necessary to ascertain the lowest limits of a dilution where an agglutination would still indicate the presence of the infection. It is called the standard dilution, at which or above which the agglutination is called positive; it is the dilution of 1 part of serum to 100 parts of

water. This standard has been accepted only after many control experiments had been made; it is higher than that accepted in Europe, and it may include a small margin of error, which does not interfere with its usefulness in the practice as long as one is cognisant of this possibility. This method has been found useful both overseas and in South Africa, where we have made up to now several thousands of tests without failures as far as we are aware, and, like everywhere else, it is now adopted as the main diagnostic medium of the disease. Not only the serum, but also the colostral milk, give positive agglutination, and usually in greater dilution than the blood serum.

There is another method, known as the complement fixation method, which gives equally good results. It is used as a controlling method in such cases where the results of agglutination may fall within the margin of error; the serum of the infected animals contains alongside of the agglutinines the specific bodies known as amboceptors, which are utilised for this purpose. Owing to its somewhat cumbersome technique, it is not so commonly used; the agglutination method replaces it entirely on account of its simplicity, and also greater accuracy.

We consider thus that, when an animal has given a positive agglutination test, it is infected. If we inject abortion bacilli into the body of an animal, these agglutinines appear after a lapse of 7-21 days in the serum; they increase and are present at one time in a maximum, and then finally disappear. This period and the amount of agglutinines vary in various animals; both stand in a certain relation to the mode of infection and the number of bacilli employed. Less antibodies are formed when the infection takes place through the mouth compared to that under the skin into the tissues and into the blood.

Agglutinines produced in animals that are not susceptible to contagious abortion usually disappear completely after a certain period. Indeed, we may conclude that when the source of the infection is not maintained the agglutinines disappear after a comparatively early period even in animals that are susceptible to the disease. This we were able to illustrate by an experiment made on a bull. Its serum was active soon after infection and remained so for a while, but it rapidly lost this quality. In cows, however, that have once aborted, the activity of a serum seems to be a permanent one, at least one that lasts over a number of years. Ever since we have kept records of cattle that have once aborted, we were struck by this fact so contrary to experiences made with other bacterial diseases, and for some time an explanation was not forthcoming. We shall consider this explanation in connection with the question of the virus-reservoir in this disease. This very fact will then explain what appeared at one time to be a discrepancy between actual observation and agglutination results, viz., that cattle were diagnosed to be infected with abortion, and yet calved normally. The diagnosis was right; the cow was nevertheless infected, but the abortion is a symptom in the disease that need not come off every time. On the other hand, it was also noted that cows that were passed as non-infected aborted subsequently; these were in the period of incubation before any or not sufficient agglutinines were formed in the blood. Therefore one negative result in an infected herd cannot be taken as final; two at

least are necessary, and after a period of at least two months, during which period the animal to be tested must be excluded from any new infection. It appears from our experience that after natural infection agglutinines do not develop so soon as after artificial infection, in which the extreme date was fixed to be twenty-one days, after which period the animal remained uninfected.

The method known as that testing with "Abortin," a product made from abortion bacilli, has only a historical value. It is no longer used for diagnostic purposes, having been found to be unreliable.

CHANNEL OF INFECTION.

An important question has always been how the infection finds its way into the system of a cow.

Good observations have been made at various times and at various places to prove that the bull is at least one of the agencies. There is no difficulty to understand this, at least as far as some contingencies are concerned. We know when we place the discharge from the vagina of an abortion cow into the vagina of a healthy pregnant cow, abortion will occur some time later. The bacilli apparently find their way into the uterine cavity. It is assumed that this takes place generally *via* the orifice, which, however, during pregnancy is tightly closed. Nevertheless, the explanation is a feasible one. A bull, however, is as a rule not serving pregnant cows, and thus there the case is somewhat different. Under such conditions the orifice is open and bacilli could find an entrance into the uterus. Such contaminations would take place directly after the bull has served a cow, in which the uterine catarrh has not completely healed out, and a multitude of bacilli are still present. It can, however, also be presumed that the infection hangs about the bull's prepuce, from where it is carried into the vagina. It may even be that in the prepuce a real growth of bacilli takes place, which maintains the source of infection. This latter presumption has indeed some support by the experiments of McFadyean and his pupils, who injected bacilli into the prepuce and found the serum of the bulls afterwards to give positive re-actions. It is further supported by observations, that the thorough disinfection of the bull's prepuce has arrested the spread of the disease in herds that contained infected cows. The agglutination test will only reveal those bulls in which the bacilli gained entrance into the circular system, agglutinines being only formed when the bacilli pass into the system. We know we can produce agglutinines in experimental animals, but the animal need not remain infected afterwards. The same can take place in the bull, and even in an ox; the bacilli having left the body, the agglutinines remain for a while. Hence it does not follow, because a bull gives a positive test, that of necessity it must infect; on the other hand, a bull with a negative serum test may nevertheless be infected. This then can be expected when the sperm contains bacilli. That such may be the case finds some support by observations made by the two American scientists, Schroeder and Cotton. They found two bulls to give positive serum re-actions. The one was killed, and an abscess was found involving the epididymis of one testicle, which was infected with abortion bacilli. The

second bull was allowed to serve a clean cow that in all tests proved to be free from infection, and the sperm from the uterus was recovered. A number of guinea-pigs were injected, and these in due time developed the typical symptoms described before. These observations at least would justify us in withholding a bull that gives a positive re-action from further use.

A great number of experiments have shewn that there are other avenues of infection. Experimentally the injection of bacilli into the bloodstream or under the skin of pregnant animals, be it a cow, a mare, a ewe, a goat, or a rabbit, may produce abortion in due time.

The same holds good for drenching with infected material or bacilli, and the entry of the infection through the mouth is therefore considered the main avenue of infection. It is evident that the more intimate the contact is between aborting and pregnant healthy cows, the greater the opportunities for picking up the infection. This holds particularly for stabled cattle.

Experiments have proved that the bacilli of contagious abortion can only thrive under suitable conditions of a selected medium. It is not likely that they find such under the conditions outside the animal's body; hence it must be expected that the infection does not thrive in a saprophytic manner. Nevertheless, the discharged bacilli, although not thriving outside, possess a certain tenacity against outside influences, which to some extent is due to mucus enveloping them that prevents a rapid drying out. Hence grass, bedding, etc., may become and remain infected for some time. A complete drying out kills the bacilli with certainty.

THE VIRUS RESERVOIR.

We conclude, therefore, that the bacillus abortus is an obligatory parasite, that can only thrive in a suitable host, and in it in a suitable place. Is this place the uterine cavity? If such be the case, it must be found there. It is common experience that a cow may abort more than once; two abortions are not so very rare, three or more are decidedly rarer. It is only natural to assume that the infection remained in the uteri of these cows between the two abortions, and the presence of bacilli might be traced by the microscope, by culture, or by guinea-pig inoculations. Experimental evidence does not support this view. When the uterine discharge from cows that have aborted was tested, bacilli were found up to fifty days after abortion, but finally disappeared. Their number and period of persistence are apparently related to the severity of the lesions caused by them during pregnancy. It would thus appear that an infected uterus is capable of cleaning itself.

This observation brings us to the question, where are the bacilli hiding between the two abortions if not present in the uterus? That they must be present somewhere we have concluded already from the fact that the serum of every cow that has aborted possesses the agglutinating activity for long periods, a fact that can only be explained by the maintenance of a constant source of infection. The already mentioned investigations of the American authors have brought light into

this question. The experiments were repeated by us, and we are able to support them.

The American experimentalists discovered quite accidentally that market milk tested for the presence of tuberculosis by injection into guinea-pigs produces the typical lesions already described. As soon as they had recognised that these were caused by the abortion bacillus they extended their investigation and found the remarkable fact, to which I alluded before, that the udder of aborted cows excretes these bacilli. So constant was this excretion that it is now considered safe to conclude that the udder forms really the habitat of the abortion bacillus in the non-infected pregnant cow, and that it can remain there for a long period. In a cow that remained under observation for seven years, periodical tests proved the milk to be infected continually. We can support this fact by our own experience, where a cow in our possession, that aborted six years ago, shews still infected milk. Indeed, since we systematically examined all cows, for the presence of bacilli in the milk, that aborted once and calved thereafter normally, we have found them to possess an infected udder. It appears that in some animals the abortion bacilli are constantly present, and intermittently in others. It is a further interesting fact that the bacilli were never found in the milk of a cow unless both her serum and her milk possessed agglutinating properties.

There are cases on record that udders were not infected, and in these it was noted that the agglutinating property of the blood serum gradually diminished and vanished, an observation that supports the view that the maintenance of agglutinating activity of the serum is due to the permanent presence of bacilli in the system.

It is also possible that milk may give a positive re-action without it being possible to detect abortion bacilli in it, as it is likely that bacilli are not excreted at all times.

There is still more evidence to support the view that the udder of a cow that has once aborted is the reservoir of the virus. The American scientists killed a number of cows that had aborted, and tested for abortion bacilli their blood, spleens, livers, kidneys, brain, ovaries, uteri, udders, milk, synovial fluids from various joints, nerve tissue, and lymph glands from all portions of the body by injection into guinea-pigs. They found in all cases two or more quarters of the udder infected, and the milk from that quarter, one or more supramammary lymph glands, and in one instance some of the pelvic glands. All other organs and tissues were invariably free from infection. We can also support this. The uterus of naturally infected cows that had aborted and died subsequently from other causes, shewed no infection.

It would thus appear that the abortion bacilli have a real predilection for the udder. An experiment by the said Americans is very suggestive in this respect. They injected bacilli into the jugular vein of a four-year-old virgin heifer, and when the animal was subsequently killed all organs and tissues were free from infection except the virgin udder, which was not functionary and never had functioned. Similar experiments made with normal non-pregnant cows always resulted in

the disappearance of the bacilli from the blood within a few hours, and the germs could only be found in the udder and associated lymph glands.

These infected lymph glands would shew the path by which the bacilli once lodged in the udder find their way into the uterus of the pregnant cow. Once a cow is pregnant, then the conditions are produced in the uterus for the bacillus abortus to thrive.

We can thus understand that a cow can abort more than once, and that every time the uterus will discharge infection thereafter for some time. But what about the cow that has an infected udder and gives birth to a healthy calf? Such cows may indeed also possess an infected afterbirth. This may occur with a cow that has never aborted. To repeat again, not all cows that are infected do abort, but such afterbirths may nevertheless be infected; in the experience of the Americans it was noted even in the third seemingly normal parturition after an abortion.

These observations were, however, never made in connection with cows which re-acted positively to the agglutination test and the udders of which were free from infection.

These observations lead to the further enquiry how calves of infected cows newly born and apparently healthy behave, having stated previously that aborted foeti may shew the presence of bacilli in their intestines. A number of calves of cows that had abortion bacilli in their milk were killed immediately after birth by the American scientists, calves which never had had access to the infected udder. It was found that such calves may harbour bacilli in their stomachs and gastrohepatic lymph glands, but invariably, when the calves were infected, the afterbirths and the uteri of the mothers were also infected.

All these observations point to the important conclusion that a cow that has once aborted, or rather that a cow that has once been infected, or perhaps better still, that a cow that has a positive agglutination test, whether she has aborted or not, may produce infected afterbirths so long as the udder of that cow contains abortion bacilli. The cow with the bacilli in the udder is the reservoir of virus, and she is in the first instance the responsible agency for the maintenance of the infection, and when calving she may spread the disease by means of an infected afterbirth.

Having seen that from the udder the uterus becomes infected, the question arises, whether an udder can become infected through its natural openings, the teats. The Americans experimented by injecting abortion bacilli into the udder, and observed thereafter abortion and the infection of the uterus. They are indeed inclined to attach to this channel some importance under the conditions of the practice. Whilst we admit this possibility, we cannot, from our South African cattle ranching point of view, attach much importance to it, and the common way of spreading must as yet be considered to take place by the bull or *via* the mouth. But with all the evidence in front of us, we now

think that the bacilli infect the uterus only after they have lodged themselves in the udder. It must be well understood that the udder shews no symptoms of illness.

IMMUNITY.

I have in this paper made allusion to the fact that a cow may abort more than once; indeed, two abortions are not so very rare, whilst three or more abortions are exceptions; three abortions have been noted by us. Whilst the first abortion can take place in any month between the third and the ninth, the greatest number of cows only abort in the seventh month. In a statistic compiled by Zwick this took place in 50.5 per cent. of all cases; 16.96 per cent. aborted in the eighth month; 14.04 per cent. in the sixth month; 8.48 per cent. in the fifth month; 4.38 per cent. in the ninth month; 4.09 per cent. in the fourth month; and 1.46 per cent. in the third month. In our experience cows that aborted a second time threw fully developed calves. This experience was also made by other observers. All observations point to the conclusion that abortus infection produces a kind of immunity which develops gradually, soon in the majority of cases, viz., those that abort only once or never at all, later in those that abort twice or more times. Seeing, however, from previous statements, that the udder of the greater number of such cattle, or perhaps of all of them, is infected for a shorter or longer period, and that in the subsequent gravidities, the afterbirth and the calves born may be infected, the immunity seems to be one of that type in which the micro-organisms are not destroyed, a state of tolerance establishes itself between the micro-organism and the host.

The substances which are associated with the subsequent infection and the resulting immunity—agglutines and amboceptors—are produced by the mother animal, and it is questionable whether normally they enter into the foetus. This fact supports the view that the disease is one of the mother and not of the foetus. Indeed, agglutination tests made with the serum of the foetus and newly born calves are but rarely positive, and wherever they give positive results they disappear soon out of the blood of the calf. This is even the case when calves are suckling on infected udders, and so partake daily of infective material. No agglutinines and apparently no other immune bodies are produced by the calf; apparently the bacilli do not find entrance into its circulatory system, and they are destroyed. Hence it cannot be expected that heifer calves born of immune cows will be immune when adults. Calves born of normal cows and allowed to suckle on infected udders may acquire agglutinating qualities in their serum, but they lose them at an early date, and whilst the calf is still suckling on the infected udder. It appears then that these agglutinating qualities are not connected with any active process going on in the calves, but are passively transmitted by the milk of the aborting cow. It is a well-established fact that the colostral milk of an aborted cow contains highly active agglutinating activities, which, however, gradually disappear as the colostral milk gives way and the natural milk appears. It is evident that the consumption of infected milk conveys neither immunity nor infection to calves, and the acquisition of immunity seems to be connected somehow

with sexual maturity; the sexual organ must be developed before the infection can take place. It is at present not yet decided whether an immunity in sexually mature animals does exist in the absence of bacilli in the udder, or in the absence of an agglutinating serum.

Attempts have been made to convey active immunity to cattle by inoculation. Experiments have shewn that a serum can be produced with highly active immunising properties, but the passive immunity so conveyed is of little practical value, and immunity observed after the injection of bacilli whose virulency was destroyed was not much better. The best results were obtained from the injection of large masses of living cultures into the subcutaneous tissue. Such virulent cultures produce, however, abortion in pregnant animals almost without fail, and can therefore not be used in these animals. When injected before conception, then a state of immunity is obtained which protects the greater number of cows against abortion. This method has been tried on a fairly large scale on some farms in England; it was introduced by Sir Stewart Stockman. It is only justified where the abortus infection is so prevalent that its use is the last resource in an otherwise desperate position, and it should only be applied under such conditions. The last word in immunity has not yet been spoken. Its relation to the infection of the udder has not yet been worked out, and more discoveries can be expected in this direction.

PREVENTIVE MEASURES.

At the present time we can do nothing with a cow that is infected; we can neither stop the forthcoming abortion, nor can we rid her of the infection. The disinfection of the uterus of a cow that has aborted, as has been generally recommended, does not seem to be a necessity or of much use, since such a uterus does not retain the infection for a long time. Only under such conditions where the abortion has led to the retention of the afterbirth and the subsequent danger of a metritis exists, can washing with disinfectants be recommended. The main care should be taken in preventing the infection. The first consideration should be given to a correct diagnosis. This can in the majority of cases be given with almost absolute certainty. Cows abort for many reasons, but where reasonable suspicion exists that it is of infectious origin, the blood should be submitted to the agglutination test. A positive agglutination test tells us that the cow is infected or has been infected, although it does not tell us whether or not she is going to abort. A correct diagnosis is essential. The main preventive treatment is then the isolation of the cows that have aborted, and under no conditions to allow them to mix with the clean herd. Where there is only an isolated case, it being the first abortion that has taken place, it is almost the safest and cheapest measure to destroy such an animal. By carefully isolating all aborting animals, the spreading can undoubtedly be arrested; the animals will then finally be divided into two herds, a clean and an infected one, and each should have its separate bull. The infected herd will gradually become immune and throw normal calves. It is, however, not yet definitely decided how long these immune animals should be separated from clean ones. Where such a separation is not possible, it should be possible to reduce the danger to a minimum if care is taken

to isolate all cows that are going to calve, and to destroy the afterbirths, and to keep the cow isolated until all discharges from the vagina have disappeared.

Where the infected animals are running in a separate herd, precautions should be taken to remove the heifer calves before they have reached sexual maturity.

A separation into two herds, an infected and non-infected one, can also be undertaken by the agglutination tests before the cows have calved. We have done this experimentally to prove the possibility. The experiment was as follows:—Sixty-three cattle—cows, heifers and one bull—from an infected herd were sent to a clean camp after they had given a negative test in August, 1915, with the exception of one cow which had calved normally in 1913 and was not in calf on arrival at the camp, but had a positive serum test. She was accidentally included in the herd, but was taken out on the first test undertaken in January, 1916. On this occasion five re-actors were detected, which were all removed, including the specially mentioned cow. Two months later, in March, 1916, the test revealed the presence of three further re-actors, which also were removed. In the third test, in May, 1916, only one re-actor was found. In the fourth test, in July, 1916, two re-actors were found. The remaining cattle were now removed to a new clean camp, and in August, 1916, re-tested, when no more re-actors were found. At the present date, a year after the last test of the herd, no further abortions have occurred. We are entitled to conclude from this experiment that by means of repeated agglutination tests the spread of the disease can be stopped by removing the agglutinating animals. It must be stated here that some of the re-acting animals removed in the above experiment aborted subsequently, some calved normally, but shewed infected udders, and some proved not to be pregnant. Under the conditions of the practice with large herds, to adopt this measure would naturally involve a great amount of work. If it cannot yet be carried out, it is only because the staff to do it is not forthcoming.

Special mention must also be given to the bull. As shewn earlier in this paper, two potentialities may occur, infection by sperm, in which case the bull most likely gives a positive re-action and infection by an infected prepuce, in which case the agglutination may be absent. The latter instance usually occurs when the bull has access to cows that have newly aborted. Disinfection of a bull's prepuce is therefore indicated.

In concluding, I wish to point out to you that the investigations into contagious abortion are practically only of recent date; we only begin to see our way in this complex problem, and if results will be obtained at the same rate as they have been forthcoming hitherto, the clearing up of many unsettled points may be looked for at a not far distant future.

Notes on Remedies for Turnip Sawfly

(*ATHALIA FLACCA*, KONOW).

By Rupert W. Jack, F.E.S., Government Entomologist.

In an article, published in the number of this *Journal* for April, 1917, the writer described the failure of arsenical sprays against the more mature grubs of the above pest. It is to be noted that no mention was made of experiments with arsenical compounds used in the form of dust. The earlier tests made with dry applications failed, owing to rain falling very shortly after the crops were treated, and the treatment was somewhat unjustifiably condemned on account of the fact that the pest thrives mainly during the wettest months of the year.

Turnip sawfly has been very prevalant during the past wet season, and for the first time recorded at Salisbury continued its ravages after the cessation of the rains. Numerous experiments were then made with a dry application consisting of—

Paris green	1 lb.
Slaked lime	20 lbs.

The mixture was applied with a pair of "sulphur bellows," such as are used for applying dry sulphur to vines in Southern Europe and elsewhere, including the Cape. Such bellows are commonly manufactured in France, and are obtainable from stores that deal in such articles throughout South Africa.

In every case the application was effective in freeing the plants of the pests, which, after about sixteen hours, were found in large numbers lying dead on the ground. It is obvious, therefore, that, if an interval of sixteen hours without rain supervenes after the treatment, this application constitutes an effective remedy. It is much cheaper than paraffin emulsion, and more effective on the larger plants. The poison did not injure the plants in any way, and its use is therefore recommended.

In preparing the mixture great care should be exercised in mingling the ingredients thoroughly, and the lime should previously be passed through a fine sieve, to remove any hard lumps which it may contain. The foliage of the plant should, of course, be thoroughly coated with the poison, but an excessive application should be avoided.

It may be added that lime by itself has a noticeably deterrent effect on the grubs in dry weather, but does not kill them. Owing to the constant rains which usually fall in January and February, when the pest is at its height, however, a deterrent which washes off as easily as dry lime can have very little value in practice.

Uses of Sunflower Stalks.

In continuation of the information previously published regarding the possible use of sunflower stalks, a further report has now been received from the Imperial Institute in London.

It will be seen that the reports are mostly of a negative character, and next to finding outlets it is best to know the actual truth as to the possibilities of such products, and for this reason there is good cause to be grateful to the Imperial Institute for its services in the matter.

The suggestion with regard to the utilisation of the pith for the manufacture of explosives has already been acted upon, and arrangements made to supply one large explosives factory with pith for investigation on the lines suggested in the accompanying report. The Imperial Institute is at present examining, on our behalf, the ash of sunflower stalks as a possible source of potassium salts.

Copy.

IMPERIAL INSTITUTE.

REPORT ON SUNFLOWER PITH FROM RHODESIA.

The pith which is the subject of this report was extracted from a consignment of sunflower stems forwarded to the Imperial Institute by the Director of Agriculture at Salisbury, and referred to in his letter dated the 4th July, 1916. A report on the value of the stems for paper-making and as a source of potash, and on the possible uses of the pith, was furnished by the Imperial Institute on the 6th June, 1917, and the present report gives the results of further enquiries which have been made as to the utilisation of the pith.

(1) *Use of the Pith as a Packing Material in the Sheathing of Ships.*—It was suggested in Rhodesia that possibly the pith might be employed in the sheathing of ships, and samples were accordingly submitted by the Imperial Institute to shipbuilding experts. The reports obtained, however, indicate that the material would not be suitable for this purpose, as it is readily inflammable, and smoulders steadily when once it is ignited.

(2) *Use of the Pith in place of Cork, etc., for making Life-saving Appliances.*—The light, buoyant nature of the pith suggested the possibility of using it in life-belts, life-buoys, etc., in the place of cork or kapok, and a series of experiments was accordingly made at the Imperial Institute to determine this point. The tests were made with the material in two forms, viz. (a) rough rods cut from the stems, and (b) ground pith. The following results were obtained in comparison with Java kapok, which is largely used in live-saving appliances:—

Experiment.	Period of immersion.	Weight of iron supported in fresh water by 4 oz. of—		
		Sunflower pith.		Java kapok (floss).
		Rods.	Ground.	
		ozs.	ozs.	ozs.
A	Immediately after immersion	61	3*	83
B	After 24 hours' immersion, with 2·5 lbs. of iron attached	56	...	83
C	After 96 hours' immersion, with 2·5 lbs. of iron attached	52	...	70 (After rough treatment following experiment B)
C	After rough treatment following experiment C	43 (The pith rapidly became waterlogged on further immersion)	...	68 (After 44 hours' immersion following rough usage)

* The ground pith became water-logged in five minutes.

From these results it is clear that the ground pith could not be employed as a buoyant material, as it absorbs water rapidly, and becomes water-logged in a few minutes. In the form of rods the pith is fairly buoyant, but it is inferior to kapok, and, as it is fragile and fails to withstand rough treatment, *e.g.*, pounding the life-belt in water, etc., it appears to be unsuitable for use in life-saving appliances. The British Board of Trade requires that kapok life-jackets should contain 24 ozs. of kapok and should support 15 lbs. of iron in fresh water for 24 hours. The sunflower pith in the form of rods would fulfil this requirement, but owing to its fragile nature it would not be regarded as a satisfactory substitute for kapok.

(3) *Use of the Pith for the Manufacture of Explosives.*—(a) As an absorbent of nitro-glycerine. It was stated in the previous report that the pith possesses no absorptive power for nitro-glycerine, and that it would consequently be of no interest in the explosives industry as a substitute for wood flour for this purpose. These initial experiments were made with the ground pith, but in further experiments, made at the request of the Imperial Institute in one of His Majesty's' explosives factories, it has since been found that the pith in the form of rods will absorb fair quantities of nitro-glycerine. Tests made in the open air shewed that rods of the pith absorbed about nine-tenths of their weight of nitro-glycerine, but considerable difficulty was experienced on account of the presence of air in the pith. Under reduced pressure the rods absorbed about nine-tenths of their weight of nitro-glycerine. It is

possible that a useful explosive might be made in this way from rods of the pith, but some nitrate would probably have to be added to make the combustion complete. For this purpose the pith might be saturated with a solution of potassium nitrate, dried, and the nitro-glycerine then added under reduced pressure. It would not be feasible to export the pith from Rhodesia to the United Kingdom for this purpose, but the material might be of service in South Africa for the manufacture of nitro-glycerine explosive. The question of the cost of preparing the pith in the form of rods would, however, require consideration.

(b) As a source of nitro-cellulose. Experiments were made to determine whether the pith could be used for the production of nitro-cellulose, but the yield was not very satisfactory. On nitration the pith lost 21 per cent. in weight, whereas cotton and other forms of pure cellulose shew a gain in weight of up to 80 per cent. on conversion into nitro-cellulose. It is obvious, therefore, that the pith would not be of technical value as a source of nitro-cellulose.

(4) *Other Uses for the Pith.*—Other purposes for which the pith might possibly find applications in South Africa are (a) as an insulating material in refrigerating plant, etc., and (b) as a packing material. Enquiries might be made in South Africa on these points.

It is improbable that the pith, owing to its brittle character, could be used successfully as a substitute for sola pith in making tropical helmets and spine pads.

Importation of Virus.

For general information, we reprint below Government Notice No. 369 of 1913, by which the importation of any virus or vaccine is prohibited without special permission. It is necessary to do this, because it is known that anthrax virus has been illegally imported, and we wish to impress upon stock owners the risk they run if they attempt to import without the prescribed permission.

GOVERNMENT NOTICE
No. 369 of 1913.

UNDER and by virtue of the powers vested in me by section 5, sub-section (6) (e), of the "Animals Diseases Consolidation Ordinance, 1904," I do hereby provide as follows:—

(1) No person, firm or corporation shall manufacture, import, sell, barter or exchange any virus, vaccine, serum or analogous product used for the diagnosis or treatment of diseases of animals without the permission in writing of the Chief Inspector.

(2) No person shall use any virus, vaccine, serum, blood, bile or analogous product for the diagnosis or treatment of animals without the permission in writing of the Chief Inspector.

(3) Any person desiring to import, manufacture, sell, barter or exchange or to use any of the above-mentioned substances or products shall apply to the Chief Inspector for his requisite permission, which may be refused or granted under such conditions as the Chief Inspector may impose.

(4) Any person contravening any of the above regulations, or failing to observe the conditions attached to any permit issued in terms of the last preceding sub-section, shall be liable on conviction to a fine not exceeding £20, or in default of payment of any fine inflicted to imprisonment with or without hard labour for a period not exceeding three months.

Rand Fat Stock Show.

The third annual fat stock and maize show and sale of pure-bred stock of the Witwatersrand Agricultural Society takes place at Johannesburg on the 4th, 5th and 6th September, 1918.

There are in all 17 classes provided for fat cattle, for which the Rand Society are offering in prize money a total of £995 15s. A new class has this year been provided for a group of five (baby beef) oxen, any breed or grade. There are also special prizes offered for the best five oxen under five years and for the best two Hereford steers under four years.

The championships this year, for which £50 will be awarded for the best single ox and £100 for the best group of five, will be judged under block test conditions, which provide that special consideration will be given for quality, weight for age and distribution of meat. The winners of the first, second and third prizes in the single and ordinary group classes must compete in the block test championships and submit

to the conditions thereof, failing which they will forfeit their class prize money. The ages of all animals will be determined by a dentition table, which is fully illustrated in the prize list, and which definitely fixes the class for which an animal is eligible. The society make a further important provision, that they will guarantee to all exhibitors whose animals are slaughtered under the block test a minimum price therefor of 55s. per 100 lbs. dressed meat.

It is hoped, in view of the large exports of slaughter stock to Johannesburg, that Rhodesia may be worthily represented at this show.

Salisbury Stock Yards.

On the 12th April the new stock yards, constructed by the Salisbury Municipality, were officially opened by His Honour the Administrator. They have been departmentally built under the supervision of Mr. J. P. Horsfield, Town Engineer, at a cost to the town of £3,500 approximately. The faith in the future of the cattle industry thus manifested will, we feel sure, be fully justified. The pens, which are very solidly erected, provide accommodation for 500 head of cattle, with room for a further 1,000 head in the drafting pens. There are also four sheep pens and four piggeries, a cattle dipping tank, a specially designed sale ring with auctioneers' rostrum and substantial brick buildings, which include cattle sheds, offices, etc. The yards are served direct by a special railway siding with ramps for large and small stock, so that animals can be brought to the yards and re-distributed therefrom from any clean district without quarantining. As the animals leave the trucks, they are drafted into paddocks, and can, if desired, pass over a weighbridge where their live weight is ascertained. In the event of stock being detained a few days in the yards, free grazing is provided. Salisbury is to be congratulated on the acquisition of these up-to-date yards, and we feel sure the cattle industry will benefit directly, and the interests of the farming community as well as of the town will be served thereby.

Review.

The Rhodesia Munitions and Resources Committee have issued an annual report which will be read with interest alike by farmers, miners and anyone who has at heart the welfare of Rhodesia. This record of effort and achievement commences with a brief account of the history and constitution of the Committee, which shews it to be an outcome of the war, a tangible token of the national awakening to the need of economic development and industrial activity, if we are successfully to resist peaceful penetration by aliens and enemies in every walk of life. Originally intended to assist in the production of munitions of war, the Committee early realised that so far as Rhodesia is concerned this term may best be interpreted in the wide sense of the supply at present, and in the future, of national requirements for which the country is by nature especially fitted, such as gold, copper, chrome and other base metals, asbestos and coal to facilitate the production of these, also grain, meat and other farm products, including tobacco. It has been further impressed upon the country that in making Rhodesia self-supporting so far as possible, and relieving pressure on the workshops and wheat fields of other parts of the world and diminishing our demands on shipping space, we are serving the Empire and the cause of the war in a very practical way. These doctrines the Committee, under the able and untiring leadership of Mr. J. G. McDonald, O.B.E., has disseminated and popularised with great success.

The report indicates the multifarious directions in which work has been done, too manifold to recapitulate here, but including, in addition to many mining and industrial matters, the following, which more particularly concern the readers of this *Journal*:—Arsenic for cattle dip, bags for produce, jam making, oil crops, cold storage, cattle branding, maize production and fibre crops.

To the report of work performed and matters discussed and ventilated is added a series of informative articles dealing with subjects many of which will be found of interest to farmers, particularly the following:—Agricultural Instruction in Schools, Lime for Agricultural Purposes, Arsenic, The Bacon Factory, Castor Oil, Cattle and Sheep Dips, Cheese Making, Dairying, The Oil Factory, Fertilisers, Forestry, The Fruit Industry, Dipping Tanks, and Cotton. We can only give the titles of these articles here without attempting to discuss them, in the hope of thereby bringing them to the notice of readers, whom we would urge to procure copies of the report to study at their leisure.

E. A. N.

Departmental Correspondence.

Under this heading we publish correspondence between farmers and the technical officers attached to the Department of Agriculture, containing information which may be of interest and assistance to our readers.

ROSE CULTURE.

To the Editor,

Rhodesia Agricultural Journal.

Sir,

I am very anxious to obtain some information about difficulties I am having with rose trees. In June, 1917, a contributor to your *Agricultural Journal* wrote on roses—a Mr. N. L. Kaye-Eddie. I am wondering if you will kindly pass on my enquiries to him, or in some other way obtain the information for me. My difficulties are mainly as follows:—I find ants, of course, a trouble, but I fight them mainly by cultivation. To help this, I have been putting coal tar on the rose stem from ground level to some distance under ground.

I have lost, and continue to lose, a number of trees, and not by any means always from ants so far as I can see. I am therefore wondering if the tar is killing them, as they are mostly young plants transferred from tins to the ground. On the other hand, I find the climbing varieties thrive vigorously in spite of the tar, and my trouble is with the standing varieties.

Again, I find that in some cases the wood of the plant looks sickly, and when I press the stems I find they are just pith. Yet my ground is well fed with well-rotted kraal manure, well broken and gradually dug in from the top. The soil is a sandy loam with a stiffish sub-soil mixed with small rubble. My ground, however, is deficient in lime. Can you give me some guidance as to rose culture in these circumstances?

The piece of land on which they are—laid out for about 70 plants—faces east and west, and is protected from wind by a 3 ft. 6 in. hedge. There is plenty of sun all day.

In regard to the varieties, for instance, Black Prince and Emperor of Morocco seem to do fairly well, also Kaiserin Augusta Victoria and Frau Karl Druschki, and yet the La France makes no progress.

I shall be very grateful for any information.

I am, etc.,

Leighton Farm.

J. H. Bailey.

Mr. Kaye-Eddie's Reply:—

Painting tar on the collar and portion of the roots would be harmful, and perhaps the cause of death of some of the plants, especially so in the case of young ones, as it would seal the pores.

Borers of different sorts attack roses; they travel down the stems and cause the branches affected to look sickly; some varieties enter at the sides, and others gain entrance where the branch has been cut back.

The use of manure should be avoided if white ants are very troublesome. Many roses do well in some soils without any manure whatever.

Should the soil be very poor, wood ash will be beneficial, and if black soil is obtainable, this might be used to fill up the holes. Fertilisers may also be used with benefit, dressing the surface and raking it in.

I should recommend a trial of the following:—Teas, Maman Cochet, Safrano, Archimedes, Devoniensis, W. A. Richardson, Marie van Houtte, Bridesmaid, Madam Lambard, Madam Jules Gravereaux. All these are very hardy, and almost constant bloomers.

The Agricultural Outlook.

At this date the anxiety of farmers turns in two directions. What will the harvest be, especially of the staple crop, maize? What are the prospects for cattle in the coming winter months? As regards the first, our opinion, based on reports from every corner of the country, is that the yield of maize will be distinctly better than was feared towards the close of the rainy season. In spite of an increased acreage under this crop, the total grain to be reaped will, however, be less than last year. The number of bags per acre will be above what was first expected, but below the usual average.

The prospects for live stock are not necessarily better than usual owing to an exceptionally heavy rainfall. It is true that a wonderful show of pasturage was seen in Matabeleland, and a very strong, even rank, growth in parts of Mashonaland. It is equally true that many old dry spruits and water holes are filled this season, and may be relied on for the winter. On the other hand, a long continuance of excessively wet weather is not good for stock, and in many cases they have not started the winter in quite as good condition as usual. In addition, it may be doubted if the full normal amount of veld hay has been saved,

owing to the late rains, which hindered hay making. Also, though the pasturage was luxuriant, early frosts in some districts are likely to cut it down, so that the veld towards the end of winter may not be much better than in other years, while the presence of specially heavy masses of dead grass will make the risk of fires greater, and their control more difficult.

Weather prognostications are notoriously uncertain, but a high authority consulted on the point of the prospects for the coming winter, in view of the unprecedentedly wet summer, has expressed the opinion that, whilst frost in calm weather is likely to be less than when the country is drier, on the other hand, very cold winds are not unlikely. It would be well to make provision accordingly by providing shelter for cattle by sheds, kraals, long low stacks as breakwinds, cattle camps in thick bush and so on, as the ingenuity of the stock owner may suggest. Everything points to the necessity of giving all stock at least as close and careful attention as in other seasons.

Veterinary Report.

March, 1918.

AFRICAN COAST FEVER.

Melsetter District.—A recrudescence of infection occurred on the farm Rookwood. In February three head were lost, and were subsequently found dead at the same spot; cause supposed to be lightning. In March another beast died; *post-mortem* and microscopical examinations shewed Coast Fever. The constant and heavy rains had rendered regular and effective dipping impossible, and although this manifestation of infection is regrettable, it is more satisfactory to be aware of it.

Victoria District.—There was a marked improvement during the month at the various infected centres, due largely to the cessation of the heavy rains. The total mortality from Coast Fever was 18 head, compared with 47 during the previous month.

Shamva (Mazoe District).—Three head destroyed on the infected farm Burnleigh.

ANTHRAX.

One case of anthrax occurred in a herd at Mtoko which had been vaccinated a few days previously, also one case in the quarantined and vaccinated herd near Headlands, in Makoni district.

QUARTER-EVIL.

The following mortality in cattle was reported:—Umzingwane, 4 head; Plumtree, 1; Inyati, 24; Belingwe, 5. In the February report 8 deaths at Gwanda were omitted.

STIFF SICKNESS (EPHEMERAL FEVER).

Reported as very prevalent in several districts.

HORSE-SICKNESS.

A considerable mortality was reported from various districts.

IMPORTATIONS.

From the Union of South Africa—horses, 10; mules, 56; donkeys, 58; bulls, 9; heifers, 71; sheep and goats, 1,678.

EXPORTATIONS.

To the Union—slaughter oxen, *via* Bulawayo and Plumtree, 112; *via* Liebig's Drift, 24; sheep and goats, 292; pigs, 10. To Belgian Congo—sheep and goats, 206; pigs, 10. To Northern Rhodesia—pigs, 74.

April, 1918.

AFRICAN COAST FEVER.

Victoria District.—At existing centres of infection the mortality was 5 head, compared with 18 the previous month.

A further extension of infection was discovered on the farm Marowa. Early in the month two deaths were reported, but the smears taken were

unsuitable for diagnosis because of putrefaction. The cattle were kept under observation, and on the 11th April two more died, one of which shewed Coast Fever, and in a few days another case occurred. It is probable that the earlier deaths were due to Coast Fever. On enquiry, it was found that an animal had died about two months previously, the cause being assigned as poverty. Immediate arrangements were made for the erection of a dipping tank; meantime the cattle were sprayed, and ears and tails hand-dressed.

Shamva (Mazoe District).—One case occurred at the infected farm Burnleigh.

ANTHRAX.

One case occurred in the quarantine area at Mtoko.

QUARTER-EVIL.

The following mortality was reported:—Bulawayo, 5 head; Umzingwane, 2; Gwanda, 20; Inyati, 25; Belingwe, 4; Nyamandhlovu, 4.

TRYPANOSOMIASIS.

Several deaths amongst cattle reported at Kennedy Halt, in Wankie district, and on farms on Portuguese border, in Melsetter district.

HORSE-SICKNESS.

The mortality from this disease continued during the month.

IMPORTATIONS.

From the Union of South Africa—horses, 18; mules, 14; bulls, 40; heifers, 118; sheep and goats, 2,512. From the United Kingdom—bulls, 7; heifers, 12.

EXPORTATIONS.

To the Union—slaughter cattle, *via* Bulawayo and Plumtree, 195; slaughter cattle, *via* Liebig's Drift, 30; sheep and goats, 145; pigs, 17. To Belgian Congo—sheep and goats, 260. To Portuguese East Africa (Beira)—slaughter oxen, 23.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

June.

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued and pruning taken in hand towards the end of the month. Washington Navel oranges and some earlier varieties will be ready this month for gathering, packing and despatch.

CROPS.

The harvesting of the smaller crops will now be over, except possibly pea-nuts, mangels and dhal. Pea-nuts should be lifted before the first frosts if possible. Mangels may safely be allowed to remain in the ground until required for use; or, if harvested, should not be heaped, but spread thinly on the ground at a convenient spot. Dhal will not be ripe until the end of the month, when the plants should be cut about a foot above the ground, allowed to dry for a few days, then shaken to free the seeds from the pods. Ploughing should be continued through the month if possible, and, if the maize is cut and stooked on the side of the lands, the maize fields should be ploughed to keep down such pests as the stalk borer. Winter crops of wheat, oats and barley will not require much attention. As a rule, where water is plentiful, too much irrigation is practised. One application per month will generally be found sufficient for the above crops.

DECIDUOUS FRUITS.

Pruning of deciduous trees should be done this month or in July.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in boxes in a warm place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

FORESTRY.

Burn out the grass in any fire traps round or near the plantation that were left unploughed. Any timber that is to be felled should be taken in hand this month.

GENERAL.

Grazing in drier districts is beginning to give out, and steps should now be taken to ensure that some good veld in the neighbourhood of the water is preserved for future use. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

Early hatching should start this month. Stock birds should have been mated up at least ten days or a fortnight before the eggs are used for sitting. See that the male birds in the breeding pens are getting their full share of food. The brooders must be thoroughly cleaned and sprayed before the chicks are placed therein. Give your first feed to the chicks as early as possible each day and the last one immediately before they retire to rest. Their food, also that of poults, should be given little and often.

STOCK.

Cattle.—There is every indication of a good winter season for horned stock, and ranching cattle should not give much trouble. Dipping is best postponed during very cold snaps until a warm day occurs. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground-nuts, ground-nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—As most vleis are still very wet, sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

TOBACCO.

If the stubble of the old crop has not been taken out and burnt, it should be done now.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beans should be staked and tied. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. After twelve months in this Territory, sheep do not contract the disease. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

Orange trees should be pruned this month, if this work is not completed. Groves must be well cultivated, especially after irrigation has taken place, and the soil round the trees hoed or dug over. Washington Navels will be gathered and some later varieties will be ready for picking. The irrigation of orange trees should be taken in hand when the trees are ready to commence the next growth.

CROPS.

See June.

DECIDUOUS FRUITS.

Pruning may be done this month.

ENTOMOLOGICAL.

Onions.—Thrip is liable to affect this crop, and when present calls for careful attention. Tobacco wash or paraffin emulsion should be used.

Deciduous Fruits.—Scale infested trees may receive a winter wash during this month. Lime sulphur salt wash or scalecide is recommended for this purpose.

Guava.—Citrus growers should always bear in mind that this fruit harbours citrus codling when there is no citrus fruit available. All guava trees, therefore, in the vicinity of citrus orchards should be stripped during this or next month, and the fruit buried deeply or burnt.

Fig.—Fig weevil may still be in evidence. The fruit is also sometimes attacked by citrus codling and other moths. The destruction of infested fruit is the most practical remedy for the pests.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. Pruning, if not already done, should be attended to early. Dahlias and other summer-flowering bulbs should be taken up and stored for division and replanting whilst the soil is being prepared. Sweet peas require attention and staking.

FORESTRY.

Cuttings of all ornamental shrubs, roses, etc., should be taken now before the spring growth starts. Plants grown in tins during the previous season should be re-potted as soon as the cold weather is over.

GENERAL.

Veld fires are now liable to occur, and must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

See that your brooder-reared chicks are warm enough during the cold nights, but do not overcrowd, and have the brooders well ventilated. Give your chicks as much run as possible when they are able to leave the brooder. There is little fear of rain now, and they will be healthier and develop better with a large shaded run. Do not let the mother hen and her brood sleep on the bare ground; they will probably be attacked by sand fleas.

STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor. Dairy cattle will require heavy feeding now, and if plenty of roughage is available, cows in milk will do better if kept in for a while on cold mornings and turned out only after the warmth of the sun is felt.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none are looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY.

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1918	March	7·33	0·32	0·08	0·23
1918	April	7·10	0·40	0·16	0·23

TEMPERATURES.

Station	March		April	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	80·0	52·3	75·5	43·6
Hartley—				
Gatooma	81·4	60·6	80·5	51·7
Hallingbury Farm	80·8	61·1	—	—
Hartley Hospital	82·8	60·8	80·9	51·4
Idaho Farm	—	—	—	—
Lomagundi—				
Eldorado Mine	77·8	61·5	74·9	52·1
Sinoia	84·0	70·0	83·2	64·6
Sipolilo	80·9	61·5	82·0	53·0
Mangwendi—				
Kwenda Hospital	—	—	—	—
Mazoe—				
Shamva Mine	81·9	62·2	79·4	55·4
Melsetter—				
Melsetter	74·6	57·0	68·2	49·6
Mount Selinda	75·3	59·8	70·6	52·6
Vermont	77·5	61·8	72·3	54·6
Salisbury—				
Chishawasha	78·2	60·9	70·4	53·0
Salisbury (Gaol)	78·4	56·5	—	—
Umtali—				
Public School	83·7	62·4	—	—
Summerfield	—	—	—	—
Victoria—				
Eythorne	81·3	58·3	—	—
Morgenster	—	—	—	—
Victoria	78·1	61·7	73·1	51·3

TEMPERATURES—*(Continued).*

Station	March		April	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	78·6	60·7	—	—
Garth	77·4	59·1	77·9	47·5
Retreat	86·0	59·4	84·6	—
Bulawayo—				
Observatory	75·3	59·7	—	—
Gwanda—				
Antelope Mine	78·7	63·9	77·9	54·8
Mazunga	85·7	65·6	—	—
Tuli	83·2	65·6	68·5	46·3
Gwelo—				
Gwelo (Gaol)	73·6	56·4	73·7	47·7
Matobo—				
Holly's Hope	80·2	60·6	78·6	49·1
Rhodes Matopo Park ...	77·3	59·3	78·3	48·0
Umzingwane—				
Essexvale	78·3	61·5	75·5	48·0
Hope Fountain	73·0	57·0	—	—
Wankie—				
Guyo	83·0	63·2	87·2	49·9
Victoria Falls	76·6	61·2	—	—
Wankie (Hospital)	89·0	66·1	88·8	59·4

RAINFALL.

Station	March	April
MASHONALAND—		
Charter—		
Buhera	7·34	0·69
Bushy Park	5·75	Nil
Enkeldoorn Gaol	9·83	0·26
Marshbrook	3·87	Nil
Range	6·99	0·36
Riversdale	—	—
Umniati	5·90	Nil
Vrede	9·72	0·12
Wylde Grove	6·59	0·04
Chibi—		
Chibi	5·26	0·54
Lundy River	6·07	0·70
Nuanetsi Ranche	4·47	Nil
Chilimanzi—		
Central Estates	9·87	0·28
Chilimanzi	6·09	0·24
Driefontein	6·25	0·38
Induna Farm	10·17	0·22

RAINFALL—*(Continued).*

Station	March	April
MASHONALAND—(Continued)		
Chilimanzi—continued		
Orton's Drift	9·82	3·23
Umvuma (Railway)	10·17	0·05
Darwin—		
Mount Darwin	—	1·01
Gutu—		
Chingombe	6·41	0·62
Eagle's Nest Ranche	9·04	0·41
Gokomere	5·38	0·65
Gutu	7·35	0·53
Hartley—		
Ardgowan	8·21	Nil
Auchter Leny	7·80	—
Battlefields (Railway)	5·47	Nil
Carnock Farm	6·90	—
Elephant Hill, Battlefields	—	—
Elvington	3·31	Nil
Gadzema (Railway)	7·50	,,
Garthnor	—	—
Gatooma	4·71	Nil
Gatooma (Railway)	8·11	,,
Gowerlands	6·61	0·17
Hallingbury Farm	3·20	—
Hartley Hospital	6·08	0·01
Hartley (Railway)	6·85	Nil
Hopewell	—	—
Idaho Farm	—	—
"Jenkinstown"	—	—
Makwiro (Railway)	5·60	Nil
Philiphaugh	3·43	0·12
Shagari	7·85	Nil
Spitzkop	6·97	,,
Inyanga—		
Inyanga	10·13	—
Rhodes Estate	7·89	—
St. Trias' Hill	14·27	—
Lomagundi—		
Argyle	7·30	0·18
Banket Junction (Railway)	6·36	0·24
Darwendale	6·50	0·54
Duxbury Farm	4·71	2·07
Eldorado Mine	3·79	0·51
Eldorado (Railway)	3·85	0·51
Lion's Den	6·45	—
Lone Cow Estate	3·63	0·47
Longmead	3·46	—
Maningwa	9·02	0·28
Mikore	7·95	0·33
Mukwe River Ranche...	0·50	1·59
Palm Tree Farm	6·59	2·33
Sinoia	5·91	0·44
Sinoia (Railway)	5·72	0·32
Sipolilo	7·14	0·48
Umvukwe Ranche	—	—

RAINFALL—(*Continued*).

Station	March	April
MASHONALAND—(Continued)		
Makoni—		
Carlow Farm	5·15	—
Chimbi Source	—	—
Delta	3·83	0·25
Eagle's Nest	5·24	0·25
Ellavale	—	—
Gorubi Springs	7·85	0·91
Headlands (Railway)	6·31	Nil
Mona	8·97	0·63
Monte Cassino Mission	7·18	1·05
Odzi (Railway)	7·01	0·58
Rusape (Railway)	5·93	0·46
Springs	6·11	0·50
York Farm	12·54	0·98
Marandellas—		
Bonongwe...	8·69	0·14
Huish Estate	6·42	0·11
Land Settlement Farm	6·12	0·07
Macheke (Railway)	4·18	Nil
Marandellas	—	—
Marandellas (Railway)	6·70	0·48
Nelson	5·55	0·03
Selous Nek	4·69	1·07
Theydon	7·85	0·15
Tweedjan	9·14	0·10
Verdoy	7·10	—
Mazoe—		
Avonduur	8·06	—
Bindura	7·37	3·36
Bindura (Railway)	8·73	2·80
Ceres	4·11	1·67
Chipoli	6·68	1·70
Citrus Estate	5·73	—
Concession (Railway)	—	—
Craigengower	8·42	1·19
Dunmaglas	—	—
Glendale (Railway)	7·46	0·61
Kilmer	9·17	—
Kingston	7·91	1·22
Laguaha	6·90	2·49
Lowdale	—	—
Mazoe	5·71	0·64
Mguta Valley	—	—
Omeath	8·78	—
Protea Farm	—	—
Ruia	—	2·51
Ruoko Ranche	4·49	1·08
Shamva	—	2·76
,, Mine	4·89	2·13
Stanley Kop	4·13	0·73
Sunnyside	6·66	0·94
Teign	9·82	0·83
Virginia	6·03	—
Volynia Ranche	7·84	—

RAINFALL *(Continued)*.

Station	March	April
MASHONALAND—(Continued)		
Melsetter—		
Brackenburg	9·98	—
Chikore	8·11	2·54
Chipinga	10·21	3·19
Helvetia	11·31	—
Melsetter	10·70	3·53
Mount Selinda	16·73	4·30
Mutambara Mission	—	—
Pasture	7·81	—
Tom's Hope	15·09	1·88
Vermont	14·11	3·49
Mrewa—		
Glen Somerset	4·40	—
Mrewa	4·39	—
Mtoko—		
Makaha	6·65	0·11
Mtoko	4·30	0·37
Ndanga—		
Bikita	16·44	4·20
Chiredzi Ranche	12·37	—
Marah Ranche	—	—
Ndanga	12·41	1·94
Pamushana	9·73	2·23
Salisbury—		
Ardbennie	—	—
Avondale	4·17	0·36
Borrowdale (Hatcliffe)	10·79	—
Botanical Experiment Station	3·61	—
Bromley	4·74	0·39
Brookmead	—	—
Chishawasha	6·80	0·14
Cleveland Reservoir	4·19	0·34
Ewanrigg	10·31	—
Forest Nursery	—	—
Glenara	—	—
Goromonzi	11·62	—
Gwebi	6·47	0·56
Hillside	4·41	0·23
Lilfordia	5·42	—
Salisbury (Gaol)	4·34	—
,, (Railway)	4·22	0·25
Sebastopol	6·98	—
Selby	—	—
Stapleford	6·13	—
Sunnyside	6·36	—
The Meadows	9·42	—
Vamona	6·70	—
Westridge	—	—
Umtali—		
Hoboken	11·11	1·91
Odzani	7·30	1·40
Penhalonga	12·03	2·37
Premier Estate	5·80	1·14
Public School	5·23	—

RAINFALL *(Continued).*

Station	March	April
MASHONALAND—(Continued)		
Umtali—continued		
Sarum	3·10	—
Stralsrund	6·07	0·48
Summerfield	—	—
Umtali (Railway)	5·47	3·82
Utopia	5·72	—
Urungwe—		
Nassau Estate	—	—
Victoria—		
Brucehame	5·35	1·04
Clipsham	5·14	1·03
Empress Mine	5·21	1·37
Eythorne	5·87	1·34
Fairburn	1·65	0·71
Fort Victoria (Railway)	4·24	0·94
Marthadale	—	—
Makorsi River Ranche	9·69	0·86
Morgenster	—	—
Silver Oaks	5·01	0·77
Victoria	4·05	0·89
MATABELELAND :		
Belingwe—		
Tamba	6·97	0·25
Wedza	7·55	0·59
Bubi—		
Bembesi (Railway)	5·02	0·03
Imbesu Kraal	—	—
Inyati	11·10	—
Maxim Hill	5·15	Nil
Shangani Estates	7·75	—
Bulalima-Mangwe—		
Empandeni	7·33	—
Garth	6·13	0·16
Mholi (late Magot)	8·11	0·15
Plumtree School	—	—
Riverbank Farm	0·01	—
Solusi Mission	6·86	Nil
Syringa	4·55	,,
The Retreat	3·16	,,
Tjankwa	—	—
Tjompanie	4·59	—
Bulawayo—		
Government House	—	—
Keendale	5·15	Nil
Khami	4·49	,,
Lower Rangemore	4·98	,,
Observatory	5·14	,,
Raylton (Railway)	3·84	—
Saw Mills	6·77	Nil
Umgusa	—	—
Gwanda—		
Antelope Mine	4·37	0·03
Gwanda (Gaol)	6·51	0·35

RAINFALL *(Continued)*

Station	March	April
MATABELELAND—(Continued)		
Gwanda—continued		
Gwanda (Railway)	—	0·40
Lamulas	11·45	Nil
Langalanga	4·62	,,
Makalali	10·62	0·11
Manantji	3·21	0·10
Mazunga	4·85	0·07
Mapande	—	Nil
Mtshabzi Mission	5·68	0·43
Tuli	6·04	0·22
West Nicholson (Railway)	5·65	0·20
Gwelo—		
Daisyfield	10·59	0·02
Dawn	5·11	Nil
Globe and Phœnix Mine	10·47	,,
Globe and Phœnix (Railway)	8·46	0·08
Gwelo (Gaol)	5·96	0·19
Gwelo (Railway)	5·26	Nil
Hunter's Road	9·34	—
Lalapanzi (Railway)	7·91	0·26
Lovers' Walk	8·81	—
Lower Gwelo	6·95	—
Oaklands	8·22	0·61
Rhodesdale Estate	6·12	Ni
Sikombela Farm	9·05	,,
Woodendhove	6·97	,,
Insiza—		
Albany	4·43	Nil
Filabusi	3·34	0·09
Fort Rixon	4·21	—
Infiningwe	3·57	0·32
Insiza (Railway)	6·62	0·03
Inyezi Farm	5·65	0·39
Orangevale	—	—
Roodeheuvel	7·98	0·46
Shangani (Railway)	3·56	Nil
Thornville	5·54	,,
Matobo—		
Holly's Hope	5·34	0·20
Matopo Mission	5·10	—
Rhodes Matopo Park	8·21	0·07
Nyamandhlovu—		
Edwaleni	—	—
Gwaai (Railway)	—	—
Impondemi	—	—
Melinakanda Junction	6·10	—
Naseby Farm	6·75	Nil
Nyamandhlovu (Railway)	9·21	,,

RAINFALL *(Continued).*

Station	March	April
MATABELELAND—(Continued)		
Sebungwe—		
Gokwe	6·97	—
Inyoka	6·04	0·13
Selukwe—		
Aberfoyle Ranche	9·54	0·71
Hillingdon	7·91	0·57
Selukwe (Railway)	15·26	1·39
Tokwe River Ranche	—	—
Tokwe Section	9·80	1·57
Umzingwane—		
Balla Balla (Railway)	4·50	Nil
Crombie's	6·03	—
Essexvale	4·16	0·33
Heany Junction (Railway)	7·43	0·19
Hope Fountain	6·40	—
Ntabenede	10·93	0·30
Springs Farm	4·57	—
Wankie—		
Dett (Railway)	3·27	Nil
Guyo	4·83	,,
Matetsi (Railway)	2·64	,,
Ngamo (Railway)	4·67	,,
Victoria Falls	4·31	
Victoria Falls (Railway)	5·39	Nil
Wankie Hospital	2·58	—
Wankie (Railway)	4·69	Ni

— No return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1918		
			June	July	August
Beatrice Road	Various farmhouses	A. V. Johnson	13	..	..
Bembesi	Queen's Mine Hotel	V. C. Andrews	7	5	2
Bindura	Bindura	C. J. Glen	8	13	10
Bromley	Bromley	A. A. Draper	6	4	1
Charter—Mgezi	Beatrice Mine	W. Krienke	26	31	28
Central	Umvuma	— James	29	27	31
Eastern Border (South Melsetter)	Helvetia	J. T. Jollie	14	12	9
Enterprise	Arcturus Hotel	J. G. M. Bernard	5	3	7
Felixburg—Gutu	Felixburg	R. H. Brown	..	13	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	1	6	3
Gatooma	Gatooma	T. J. Golding	15	20	17
Gazaland	Chipinga	W. Wood	29	27	31
Greystone	Various farm houses, Shangani	M. Kerr	8	13	10
Hartley	Hartley	J. de L. Nimmo	29	27	31
Headlands	Headlands	J. M. Harvard	29	27	31
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	8	13	10
Insiza—Shangani	Shangani	T. E. Penny	1	..	..
Inyanga	Farm Cheshire	F. W. Thiel	29	27	31
Inyazura	Inyazura	A. C. Curling	19	17	21
Iron Mine Hill	Iron Mine Hill	T. Irving	8	13	10
Lalapansi	Lalapansi	T. Wotherspoon	15	20	17
Lomagundi	Sinoia	A. H. Layard	Saturday	nearest full	moon
Lydiate	Norton	W. Wrench	29	27	31
Macheke	Macheke	J. Cheyne	No	fixed dates	
Makwiro	Makwiro	C. D. Voigt	21	19	16
Marandella and Mangwendi	Marandellas Farmers' Hall	A. Nicholson	1	6	3
Makoni	Rusape	J. G. Monckton	1	6	3
Makoni North	Makoni North	———	29	27	31
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	5	3	7
Matopo Branch, R.L. and F.A.	Sibali	———	..	10	..
Mazoe	Glendale Siding	A. G. McCall	12	10	14
Melsetter (North)	Various farms	N. N. Rutherfurd	1	..	..
Midlands	Gwelo	A. Cox, Box 93, Gwelo	14	12	9
Northern Umtali	Farm Summerfield	R. O. H. Blurton	1	..	..
Norton and District	Norton Store	H. Grimmer	1	6	3
Que Que	Que Que	E. J. Ross	15	20	17
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	28	26	30
Shamva	Shamva	Wm. Scott	..	17	..
Selukwe	Selukwe	F. S. Clark	No	fixed dates	
Somabul and Shangani Flats	Weltevrede School	G. B. Botha	..	13	..
Umvukwe	Various ranches	M. Mitton	15	13	17
Umtali	Christmas Pass Hotel	J. S. Holland	1	6	3
Victoria	Victoria	John Rennie	7	5	2
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	8	13	10

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc. ; and generally on all questions relating to live stock and to tillage operations.

Farm Seeds

The undermentioned seeds grown on the Government Experiment Farms are offered for sale at the prices stated. The amounts available are limited.

The prices quoted are f.o.r. Salisbury, or, when available, from the Gwebi Experiment Farm. The distribution of seed will commence from the 1st September, except in the case of Napier's fodder, which will be distributed from the 1st December only. Napier's fodder will be sold in bags containing approximately 200 roots, but no guarantee can be given of the exact number contained in each bag.

On account of the limited supply available in some cases, it is impossible to guarantee the full delivery of any order. *Farmers are therefore requested not to enclose cheques until they are advised as to the amount of seed allotted to them.* The seeds are consigned carriage forward in the case of stations. In the case of sidings the amount of railage will be notified after despatch.

All orders for seed must be addressed to the Government Agriculturist, Department of Agriculture, Salisbury.

1. Boer manna seed, 3d. per lb.
2. Buckwheat (Japanese), 10s. per 100 lbs.
3. Castor oil beans, 2d. per lb., 15s. per 100 lbs.
4. Dhal (ordinary), 2d. per lb., 15s. per 100 lbs.
5. Sudan grass seed, 2s. 6d. per lb.
6. Sunflower (black seeded), 2d. per lb., 15s. per 100 lbs.
7. Napier's fodder roots, 5s. per bag containing approximately 200 roots.

Forest Nursery—Sale of Trees

A list of the trees and shrubs available for sale, with prices, may be obtained on applying to the Assistant Agriculturist, Salisbury.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only :—

AGRICULTURE.

No. 61. Requirements in sending Botanical Specimens to the Department for Identification.
No. 62. Services of Agricultural Engineer.
No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 90. Reports on Experiments—Experimental Station, Salisbury, 1910-1911, by J. H. Hampton.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 134. Plans and Specifications for Flue Curing Tobacco Barns.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.
No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultural Engineer.
No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.
No. 177. Notes on the Raising of Seedling Trees, by F. B. Willoughby.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 206. Hints on Irrigation : Small Earthen Storage Reservoirs, by W. M. Watt.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 222. Costs of Farm Operations, Gwebi.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.

No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 260. Rhodesian Farm Orchard, by A. G. Turner.
No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 126. Turkish Tobacco.
No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 138. Tobacco Culture (Virginia)—Harvesting and Curing.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 175. Notes on Lucerne, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch-Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 43. Citrus Psylla.
No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 140. Insect Pests of Tobacco in Southern Rhodesia, by R. W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.

No. 151. Potato Spraying Experiments for the Control of Early Blight, by Rupert W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 53. Animals Diseases Consolidation Ordinance, 1904.
No. 65. Common Ailments of the Horse, by D. R. Chatterley, M.R.C.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.
No. 180. Note on the Treatment of Biliary Fever of the Horse with Trypan Blue, by Ll. E. W. Bevan, M.R.C.V.S.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

LIVE STOCK.

No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 205. Home Butter Making, by R. C. Simmons.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.

No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.
No. 242. Construction of Dipping Tanks (Revised).
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 282. Management of Dipping Tanks, by J. M. Sinclair, M.R.C.V.S.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 157. Hints on Brickmaking, by G. T. Dyke.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 226. Classification of Clouds.
No. 237. The Analysis of Agricultural Products, Soils, Water, etc.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 266. Directory of Farmers. (Price 1s.)
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 275. War Settlement in Southern Rhodesia.
No. 283. Maize Foods for the Home.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Malaria: its History, Prevention and Cure, by A. M. Fleming, C.M.G., M.B., F.R.C.S. (Ed.), D.P.H. (Camb.), Medical Director.
Game Law: Summary of.
Terms for Analysis by the Department of Agriculture, of Produce, Soils, Water, etc

HANDBOOK OF TOBACCO CULTURE for Planters in Southern Rhodesia. Sold by the Department of Agriculture. 2/6.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS VACANT.

A. J.—For learner; work will include ploughing and overseeing natives.

J. M.—For learner; general farm work, including cheese making; board and small salary.

SITUATIONS WANTED.

X. Y. Z.—Position as farm or estate manager; experienced; pedigree imported cattle; feeding and showing cattle and bulls for sale; general agriculture and ranching; excellent testimonials.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 112 of 1918.] [29th March, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 482 of 1917, and in terms of section 17 of Government Notice No. 21 of 1917 to declare the following area of infection :—

GWELO NATIVE DISTRICT.

Area of Infection.

The farms Riverbend, Sunbury, Cross Roads, Wedgraai and Reserve.

Note.—The farms Cross Roads, Wedgraai and Reserve are removed from the area of infection by a subsequent notice.

No. 129 of 1918.] [19th April, 1918.

IMPORTATION OF CATTLE.

HIS Honour the Administrator has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to amend Government Notice No. 22 of 1917 as follows :—

1. Liebig's Drift on the Limpopo River shall be an additional port of entry for—

(1) cattle entered in a South African Stud Book ;
(2) cattle imported from Great Britain and Ireland, the United States of America and the Kingdom of the Netherlands.

2. The importation of cattle in terms of section 1, sub-section (1) hereof will only be permitted under the terms and conditions laid down in sections 2, 5, 6 and 7 of the said Government Notice.

3. The importation of cattle in terms of section 1, sub-section (2) hereof will only be permitted under the following conditions :—

(1) a permit shall be required from the Chief Inspector, which may contain such conditions as shall from time to time appear expedient ;
(2) importation shall be through and direct from the port of Capetown ;
(3) a certificate under the hand of a Union Government Veterinary Surgeon shall be produced that such cattle have been subjected to the tuberculin test and shewn no re-action thereto.

4. Any person introducing cattle in contravention of these regulations, or failing to comply with any of the conditions attached to permits to import, or furnishing applications, declarations or the necessary documents known to be false in any material particular, shall be liable to the penalties laid down in section 7 of Government Notice No. 22 of 1917.

No. 142 of 1918.] [3rd May, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area :—

(a) *Area of Infection.*

An area in the Victoria, Ndanga and Gutu native districts bounded by a line drawn from the north-west beacon of Marowa Farm, along the western boundary of same, the western and southern boundaries of Salemore, the southern, eastern and northern boundaries of Doornfontein, the western and north-western boundaries of Cleveland, and from the northern beacon of the latter in a direct line to the north-east beacon of Marowa; thence along the northern boundary of same to the first-named point.

(b) *Guard Area.*

That portion of the Gutu native district lying south of a line drawn from the north-east beacon of the Zimutu Reserve, along the southern boundaries of the farms Ingogo, Rocklands, Merrilies, Morpeth and Dysart to the Mtilikwe River; thence down this river to where the Victoria-Gutu road crosses it; thence along this road to Gutu; thence along the Gutu-Chingombi road to the Chingombi Mission Station, and thence in a line due east to the Nyadzidzi River.

No. 143 of 1918.] [3rd May, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 213 of 1917, and in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard area in lieu thereof :—

(a) *Areas of Infection.*

The farms Lounton and Erichsthal, in the Victoria native district.

(b) *Guard Area.*

The Victoria native district, excluding the Nyadjena Reserve, the Mukorsi River Ranche, the Tokwe River Ranche and the Nyazugwi Ranche.

No. 145 of 1918.] [3rd May, 1918.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 105 of 1918, and in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection in the Victoria native district in lieu thereof :—

(1) The farm Riverside.

(2) That portion of the farm Brooklands west of the Victoria-Umvuma road.

No. 144 of 1918.] [3rd May, 1918.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farm Marowa, Victoria district, His Honour the Administrator has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to declare the following areas to be actively infected with African Coast Fever for the purposes of the said Ordinance.

Description of Areas.

(a) Victoria Native District.

The Zimutu Reserve and the unalienated land lying between the said reserve and the Makoholi River.

(2) Gutu Native District.

That portion of the Gutu native district lying south of a line drawn from the north-east beacon of the Zimutu Reserve, along the southern boundaries of the farms Ingogo, Rocklands, Merrilies, Morpeth and Dysart to the Mtilikwe River; thence down this river to where the Victoria-Gutu road crosses it; thence along this road to Gutu; thence along the Gutu-Chingombi road to the Chingombi Mission Station, and thence in a line due east to the Nyadzidzi River.

No. 156 of 1918.] [10th May, 1918.

COMPULSORY DIPPING.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Compulsory Dipping Ordinance, 1914," to amend Government Notice No. 202 of 1917 by placing an area within a five-mile radius of the Police Camp at Makaha under compulsory dipping, as prescribed by Government Notice No. 201 of 1917.

No. 157 of 1918.] [10th May, 1918.

HIS Honour the Administrator has been pleased, under the provisions of section 7 of the "Compulsory Dipping Ordinance, 1914," to amend Government Notice No. 489 of 1917 by adding the area under the control of the Village Management Board at Sinoia to the area described therein.

No. 158 of 1918.] [10th May, 1918.

APPLICATIONS FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
T. B. Hulley ...	Nyachua	Umtali	Farm Shigodora
W. J. Woods ...	Umwindsi	Salisbury	,, Colne Valley
Sclater & Jollie ...	Chibuzana tributary	Melsetter	,, Helvetia

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications, together with a full statement of the grounds for such objections.

Exhibit of the Department of Agriculture at Gwelo Show.

THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture,

assisted by the Staff of the Agricultural Department.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

MAIZE PROSPECTS.—Maize shelling is now busily in progress throughout the country, and reports are being received which confirm the impression that the cobs are by no means large nor the grain well developed and heavy. This is attributable to the cold, dull and excessively wet season, warmth and sunshine being essential for the production of the starch which fills the maize berry. Consequently fears are entertained that the yield may be deficient. In preparing the preliminary forecast three months ago, on information furnished by farmers, allowance was made for these probabilities, and even a very conservative estimate allows a considerable margin available for export—something in the region of 300,000 bags.

The districts on the eastern border, Melsetter, Umtali and Inyanga, have suffered more than others, and on the other hand, the region round Bulawayo, including Plumtree and Gwanda, is better than usual. Undoubtedly the red land has not been so seriously affected as the granite soil, on which throughout several districts a severe failure is recorded.

The local price of maize is not influenced really by the amount available for export. So long as there is even a small excess more than is needed for Rhodesian consumption, and so long as control is exercised so that over-exportation cannot take place, prices are likely to shew no such great fluctuations as would be the case if a shortage occurred either from a partial failure of the crop or from injudicious export. There is, therefore, under present conditions little room for speculation or for considerable variations in price.

A profitable return to the farmer must be assured proportionate to the cost of production, and when, as last season, the crops are light and the cost of implements, fertilisers and particularly of bags is so enhanced, the better prices ruling to-day, as compared with a few years ago, are not really so very remunerative as at first sight they appear.

After the war, the present system of controlling by permit the export of maize will cease, and unrestricted exportation will be resumed, and the speculative element, with all its attendant dangers to the producer, will come into force. This could be prevented by continuing the present system of export by permit only, and the matter is one which deserves the earnest attention of all concerned with the development of agriculture and trade, and the future prosperity of the farmers and the country as a whole.

There are those who advocate that to-day the Government should fix the price of maize within the country, on the ground that the price must be maintained above that which it now tends to take. This extreme measure can hardly be justified on the grounds named—those of war; moreover, it would be easy to evade any such arbitrarily fixed minimum price. There are others who wish a maximum limit to be fixed, but this is equally arbitrary and unnecessary, since competition tends to level prices. If the export of maize is not controlled in the future, there would be nothing to prevent over-exportation, and maize would be liable to become a symbol for gambling instead of a staple for trade. The average working farmer wants an assured reasonable profit on his labour and capital, not a sporting chance of fortune or failure.

Maize grading is in progress, as in previous seasons, and exporters would do well to arrange some time in advance for the examination of their grain, so that no difficulties may arise in obtaining certificates. The English market buys on the official grade certificate.

The direct sale of maize to the Imperial authorities arranged for last year could not be repeated this year, and had our surplus crop been heavy, difficulty might have been experienced in securing shipping for it.

A Bonus System for Farmers.—In order to encourage production, it has been decided by the British South Africa Company to give suppliers to the Bacon and Oil Factories an interest in those concerns similar to that given in the case of the Gwelo Creamery.

As soon, therefore, as the losses incurred on the earlier years of the factories' working, after charging them with interest at 6 per cent. per annum on the capital employed from time to time, paying all working expenses and making proper provision for depreciation, have been made good out of profits, the Company will divide equally between itself and the suppliers any profits that may be made in excess of 6 per cent. per annum on the capital invested in the factories, each undertaking being dealt with separately.

The method of distribution will be to devote one-half of profits in excess of 6 per cent. per annum to paying cash bonuses to suppliers *pro rata* to the amounts paid to them for their supplies during the financial year in respect of which the bonuses are paid.

In the event of the British South Africa Company wishing at any time to sell these undertakings, or any one of them, it holds itself free to do so unconditionally, and the above arrangement would terminate, or it may be terminated at any time by the Company giving one year's notice in the local Press.

Balance sheets and profit and loss accounts of the above three undertakings as at the 31st March last, certified by the Company's auditor, will be published as soon as they are completed, and similar information will be published annually during the continuance of the above arrangement.

Sale of Friesland Cattle.—It has been decided to dispose of the stud herd of pure-bred Friesland cattle from the Government experiment farm, Gwebi, with a view to replacing them by a beef breed.

The herd, including the famous imported American-bred bull Dutchland Colantha Sir Cornucopia and some twenty head of females, was originally purchased from Messrs. Maclaurin Bros., of Pomona, near Salisbury, in 1913. Sir Cornucopia combines in his pedigree some of the most fashionable and extremely developed milking strains of the breed in the United States, and was at the time of his importation the highest priced bull in Rhodesia. The females were originally purchased by Messrs. Maclaurin Bros. from the herds of Messrs. R. Cross and J. Bartlett, of the Cape Colony, or were bred at Pomona.

Amongst other bulls of note whose blood is represented in the herd are the following:—

Conqueror, No. 7, Vol. I., South African Stud Book;
Sir David, No. 58, Vol. III., South African Stud Book;
Prince Korndyke Frenesta, No. 81, Vol. III., South African Stud Book;
Kuperus II., No. 26, Vol. I., South African Stud Book.

All the cows have been regularly milked without their calves, and the entire herd has been subjected to weekly dipping for a number of years.

A large number of cows and heifers are eligible for entry either in the Stud Book proper or in the appendix section, subject to inspection. No opportunity for the inspection of the herd by a representative of the Stud Book having occurred, it has not yet been possible to have them entered.

The herd consists to-day of some forty head—the sire, cows, heifers and calves. Careful records having been made, the milking powers of each cow over several lactation periods are known and published in the catalogue, together with dates of birth and service and the pedigree. None will be sold out of hand before the sale. The terms of the sale are cash, except in the case of approved purchasers, to whom three months' credit may be granted by special arrangement prior to the sale.

For the convenience of buyers, it has been arranged that the sale will be held at the Municipal Stock Yards, Salisbury, at the time of the agricultural show there, on 23rd August, commencing at 9.30 a.m., and the animals will be brought in from the Gwebi experiment farm the day before. Messrs. Whitfield & Co. (Mr. W. H. Williamson) are the auctioneers, from whom or from the Department of Agriculture, Salisbury, descriptive catalogues may be had on application.

Registration of Friesland Cattle.—The Friesland Cattle Breeders' Association have decided to arrange for the examination by their official inspector of Friesland cattle in Rhodesia at the same cost as in the Union, viz., 10s. per head for members of the association. Hitherto a fatal drawback to the registration of Friesland cattle in this Territory has been the difficulty of arranging for a visit by the officer entrusted with the responsible task of accepting animals for the stud book and the expense of so doing. This is to be overcome by the association, and we would urge all interested in the Friesland breed to avail themselves of this opportunity. It is understood that the inspector will tour Rhodesia at an early date for this purpose, and owners of Friesland cattle would be well advised to put themselves in touch with him, addressing letters either through the Department of Agriculture, Salisbury, or direct to the secretary, Box 377, Bloemfontein.

Poultry Expert.—For some time past a notable change has been observed in regard to the poultry industry throughout South Africa, where large importations have now given place to a considerable balance of trade in favour of export. Rhodesia has not as yet participated in this happy condition of affairs; indeed, the position is far from satisfactory, supplies being limited, in spite of attractively high prices. It is felt that there is room for improvement in this respect, and that there is much to be learnt on the subject. Undoubtedly the great trans-

formation in the south has been largely assisted and expedited through the activities of a band of Government poultry instructors, who in a few years have effected a revolution as regards the production of eggs and the supply of table poultry of all kinds. The times have been propitious, and the public anxious to avail themselves of the opportunities given.

In Rhodesia the public are fully alive to the possibilities of poultry keeping and the conditions equally favourable, if not more so. The need of an itinerant instructor has of late begun to be felt, and it is therefore satisfactory to be able to announce that Mr. Arthur Little has been appointed to act in this capacity in Southern Rhodesia. Mr. Little is well known as being one of the leading poultry experts in South Africa, where he was largely instrumental in inaugurating the measures which have there proved so successful. In addition to past experience in Government service, Mr. Little has also been a successful poultry farmer himself on a very large scale, and has been instrumental in managing egg-laying competitions and organising commercial co-operative egg and poultry societies, as well as judging, lecturing, teaching and advising upon all branches of the subject. Enquiries regarding poultry matters are now invited from all interested. Visits for the purpose of personal advice will be arranged, and it is suggested that farmers' associations might profitably hold special meetings for courses of instruction, demonstration or discussion of poultry subjects. It is confidently hoped that much profit and advantage may thereby result.

Veld Fires.—The danger of veld fires at this season is great, and again we draw the attention of farmers to the fact that the Native Commissioners of all districts are prepared to assist them to obtain help from local natives in clearing fire guards along suitable lines to safeguard the veld from destruction. By a little friendly co-operation farmers can thus at small cost protect themselves individually or in groups against the menace from whatever direction it may come. Farmers would be well advised to communicate early with the Native Commissioner of their district on this subject.

Mr. Mackie's Gift.—In connection with the Bulawayo show, special interest attaches to the munificent gift to the Rhodesian hospitals, consisting of seven pedigree Aberdeen Angus cattle, five bulls and two heifers, from the celebrated Doonholm herd. The animals arrived from Scotland safely and in excellent condition, and were put up for auction at the sale of stock in the show yard. Their appearance, quality and condition did credit to their breeding, and on their merits they worthily upheld the reputation of their race, and gave a timely fillip to the black polls which are so rapidly coming to the fore in Rhodesia at the present moment.

Bidding was keen, and whilst the higher prices were influenced to some extent by sentiment, yet the fine bulls and heifers are well worth a large sum of money. The excitement round the ring rose to a high

pitch, and when the animals were sold hearty cheers were raised for the generous donor, who in his kind and well-devised act at once benefited a very deserving cause, the cattle industry of this country, the breed he had selected as the medium of his gift, and incidentally, set a worthy example for others to follow.

The following were the buyers and the prices realised :—

Eligible of Doonholm, the B.S.A. Co.'s Rhodesdale Ranch	£315
Escodoro, Theo. Haddon, Esq.	210
Redoubt, Duncan Black, Esq.	150
Eugenicist, Duncan Black, Esq.	235
Equorean, J. R. Stewart, Esq.	190
Production, J. R. Stewart, Esq.	140
Riga, J. R. Stewart, Esq.	175
	£1,415

A Rhodesian Dipping Fluid.—We are given to understand that the Standard Arsenic (Rhodesia), Ltd., which owns the mines and works from which white arsenic (arsenious oxide) has of late been successfully produced, now contemplate a further development. They propose manufacturing arsenite of soda, which can be used for cattle dipping purposes, and also hope ere long to place on the market a concentrated dipping fluid.

In this connection one obvious difficulty, an outcome of the war, is that of obtaining suitable containers for such an article. We have been asked to call the attention of the farmers to this fact, with a view of their saving empty oil and dip drums, not the light, rectangular paraffin tin, however, and from five gallons capacity upwards, as the manufacturers are anxious to obtain as many as possible within the country.

Loans for Dipping Tanks.—For general information it is announced that the Land Bank is now prepared to make advances up to £75 for the erection of dipping tanks, on the security of a promissory note signed by the borrowers, with only *one* approved surety instead of *two* as formerly.

Such loans would be granted for a period of 12 months, with the option of renewal of 50 per cent. of the principal for a further year if desired, whilst interest will be charged at 7 per cent., payable in advance. Applications should be addressed to the Manager, the Rhodesia Land Bank, Limited, Bulawayo.

Arsenical Poisoning.—The attention of stock owners is again directed to the dangers attendant on the use of arsenic in every form, and especially as a cattle or sheep dip. Several cases have recently

been investigated where a heavy mortality occurred in cattle through their licking the soil in draining pens, and where cattle had been sprayed.

Arsenic never loses its poisonous properties, and is, therefore, a source of danger as long as animals have access to it.

The Rhodesian Native Labour Bureau.—We take the following extracts from the report of the members of the board of management of the Rhodesian Native Labour Bureau for the twelve months ended 31st December, 1917:—

Recruiting.

The number of natives supplied to employers of labour during the year was 10,110. All natives were engaged under a twelve months' agreement.

During the year under review 5,589 natives were repatriated by the Bureau; recruits exceeded the repatriates by 4,989.

It will be seen that of the total labour distributed during 1917:—

Mines received	3,784 natives	—37.43 per cent.
Farms received	5,162 natives	—51.06 per cent.
General employers received	934 natives	— 9.24 per cent.
Employers in Northern Rhodesia received	230 natives	— 2.27 per cent.
	10,110 natives	—100.00 per cent.

Of the 3,784 natives supplied to mining members, 848 were distributed to small workers, equal to 22.4 per cent. of the total mine labour delivered.

During the year 760 natives re-engaged with their employers at the expiration of their original term of service.

The membership of the Bureau at 31st December, 1917, was as follows:—

	No. of Members.	Shares held.	Share Capital paid up at 2/6 per share.
Mining and general employers ...	276	22,236	£2,779 10 0
Farmers	1,210	3,317	414 12 6
	1,486	25,553	£3,194 2 6

These figures shew that 18 mining and general members and 130 farming members joined the Bureau during the year, whilst six mining and two farming members surrendered their interests in the organisation. The net increase in membership is thus: 12 mining and general employers and 128 farmers.

Permission was received from the Administration of Northern Rhodesia to resume recruiting in their territory in October, 1916, and accordingly operations were energetically undertaken. However, in February of the year under review, it again became necessary for the

Northern Administration to prohibit recruiting in North-Eastern Rhodesia for reasons of military necessity, with the result that the Bureau was unable, for causes beyond its control, to supply the full number of natives asked for.

The rebellion in the Tete and Barue districts of Portuguese East Africa caused a serious dislocation of the Bureau's organisation in that area, resulting in a considerable falling off in the number of recruits obtained, and the loss of an appreciable sum of money. It is anticipated that order will speedily be restored, when the Bureau will endeavour to increase the influx of recruits from Portuguese East Africa.

During the year recruiting operations were commenced in the Tati district of the Bechuanaland Protectorate, but only 143 labourers were obtained. The superior attractions of the Witwatersrand render any future improvement in the results problematical.

In the course of his remarks at the annual meeting of the Bureau, Mr. Upton referred to the question of labour supplies in the following terms:—"The causes which are affecting the labour supplies of the country to-day, and particularly that portion of it which comes through the Bureau, are absolutely beyond our control. We have bombarded the Administration of Northern Rhodesia with letters and telegrams asking them to try and satisfy our demands; and Sir Drummond Chaplin was kind enough to send a personal telegram to Sir Lawrence Wallace on the same subject. But he received a reply to the effect that until the war was finished we had not a hope of obtaining labour. General Northey is dependent for his transport on the services of the natives from Northern Rhodesia and Nyasaland. The Governor of Nyasaland has issued a prohibition on the recruitment of native labour, and I can only repeat that until that prohibition is removed there is little prospect of fulfilling the demands of our members. We are getting some labour from Barotseland, but as regards the Zambesi valley there is not a very big population there, and all their crops this year had been washed away by the flooding of the river. These people have had to re-sow their crops, and, as a matter of fact, to-day they are living on wild fruits and that sort of thing. Therefore, we shall not obtain our full supply of labour from that country. In Portuguese territory the rebellion has only just ended, and turmoil still exists there, but the results are improving every month, and we hope to receive at least 2,500 natives from that territory this year. We have already received 1,000 natives from Tete. I would like to point out that we have already delivered 4,000 natives this year, and we have applications for 10,000. I doubt very much if we shall be able to supply another 5,000. I see no hope or prospect of being able to supply more than 50 per cent. of the demand of our members. There is no country open to us for the recruitment of labour, and, of course, we cannot go to the Union. In the Bechuanaland Protectorate we got 140 odd last year, and the reason for that small number is the superior attractions of the Witwatersrand, where they pay £3 10s., as against our 25s. The Witwatersrand offer more inducements in the way of pay and treatment than we do. But we have to put up with these difficulties until normal times are resumed."

Importation of Cattle.—Permits for the importation of cattle from the Union can now be obtained from the Assistant Chief Veterinary Surgeon, Bulawayo.

Foul Brood in the Cape Province.—Information has been received from the Union Department of Agriculture to the effect that the bee disease known as European foul brood has recently been identified from a number of apiaries in the Western Province. Previous to this discovery the disease was not known to occur in South Africa, and legislation has been in force during the past decade with a view to its exclusion. Whilst the manner and date of its introduction remain unknown, there is nevertheless reason to believe that the trouble has been present for a considerable number of years, the infection having already spread over a somewhat extended area. The matter is receiving the attention of the Union authorities, and our own Department is being kept informed concerning developments. In the meantime, steps are being taken with a view to guarding against the introduction of the disease into this Territory from the Cape.

A Market for Rye.—In connection with the new Government ration flour now in use throughout the Union, it has been found that for certain purposes it is necessary to add grain containing a high proportion of gluten. We understand that for this purpose rye has given the best results so far, and that accordingly a demand is likely to arise amongst millers for rye to be added in certain proportions to their mixtures of wheat and maize. The Department of Agriculture will be glad to put farmers having rye for sale in communication with enquirers.

Our Agricultural Shows.

The Bulawayo Agricultural Society's meeting on the 28th and 29th May again established its claim to being the most important cattle event of the year. Very great improvement and additions had been made to the accommodation for all classes of exhibits and for the public, but owing to the increased number of entries in the cattle sections and a record attendance it was found that barely enough room was available, and that immediate arrangements must be made for still further

additions next year. The society having arranged to hold a special meeting for slaughter stock and produce in August, only breeding stock was on view. Although possibly no one class was quite equal to the senior Shorthorn bull class of last year, a most gratifying and marked improvement was noticeable in the quality and numbers of stock generally. The evident skill and trouble which had been expended in almost all cases in the preparation of the animals for exhibition was specially remarked upon by no less an authority than Mr. Livingstone Moffat, the President of the Shorthorn Society of South Africa, who considered that in this respect the show was unsurpassed by any of the meetings of the Union. This fact may at first sight seem a small matter, but regarded as an indication, which it undoubtedly is, of the growing interest and knowledge of stock matters amongst the farming community of this country, it is of great importance. Mr. Jarvis Palmer, general manager in South Africa for Messrs. Cooper & Nephews, and well known to Rhodesians, expressed the opinion that the Bulawayo show was in a fair way to become the leading show of beef cattle in South Africa, if it had not already become so. Those of our readers who were not present will have long since learned from the Press the details of the awards, and no useful purpose would be served by recounting them at length here. We may, however, touch on one or two of the more prominent features of the exhibition. The competition for the Thousand Guinea Trophy was, of course, the great attraction, and was remarkable this year as being the first time in which cattle owned in the Union of South Africa have competed. Mr. Jack Parr, of Bloemfontein, brought up two fine Aberdeen Angus bulls, one of which, "Pastime," succeeded in being placed second to Mr. Woodforde's bull "Raithby Blenheim." That redoubtable bull "Lomond," which won against all comers three years in succession, did not again compete, but Mr. Drummond Forbes' herd was represented by an extraordinarily handsome young bull, "Millhills Champion," lately imported from Scotland, which was somewhat handicapped by his youth and the fact that he had only been six weeks in the country. Of great quality and style and beautiful breeding, this young bull was easily first in his class, and may be expected again to give a good account of himself in the competition for the trophy next year.

Mr. Woodforde's bull, selected and purchased for him six months ago by Mr. E. C. Bird, had no easy task to defeat the splendid animals brought against him, and it was only after a very prolonged discussion that the judges, Messrs. Abbott, Harrison and Webber, all from the Union, were able to declare him the winner. Mr. Woodforde has twice been the runner up with his old bull "Prince Worcester," and all were delighted that such a keen breeder and good sportsman should have succeeded, and in such really first class company, and although competitors from the Union are more than welcomed, it is perhaps pardonable to feel some pride that our own breeders and owners are as yet unbeaten in this great annual contest.

The runner up, the Aberdeen Angus bull "Pastime," seven years old, is undoubtedly a magnificent animal, and by far the largest bull of his breed ever seen in Rhodesia. He was originally at the head of the herd of the Cedara Agricultural College. He has remained in

Rhodesia with Mr. Evans, of the Kent Mine, Penhalonga, and we sincerely hope that he may do good service for his new owner and the country, and that his age and weight may not prove too great a handicap.

Messrs. Cooper & Nephews' young Hereford bull "Sandown Jupiter," aged 12 months, was not turned down without a great fight for supremacy. Bred in Rhodesia, at Sandown, by his owners' great bull "St. George" out of "Silver Star," he reminded one forcibly of the first trophy winner, "Devonby Dreadnought," and should grow into an extremely valuable bull.

Shorthorns throughout were strong, and possibly the female classes, in which animals belonging to the B.S.A. Company's Shangani Ranch, Mr. Drummond Forbes and Mr. E. A. Hull were competing, were the best yet seen in Rhodesia.

Herefords, as one would expect to find in Bulawayo, were numerous, and their numbers were swollen by the addition of 20 good ranch bulls from Sir Abe Bailey's herd at Colesberg, which were sent up for sale, and were afterwards disposed of at very good prices. Messrs. George Mitchell, Jobling, Beamish Bros., Cooper & Nephews and John Mack provided the winners, all of which were of excellent quality.

Interest was added to the Aberdeen Angus classes by the inclusion of five bulls and two heifers, imported by Mr. P. Jeffrey Mackie, for sale, the proceeds of which have been given to Rhodesian hospitals, and by the two bulls, "Pastime" and "Prospectus of Hatton," brought up by Mr. Jack Parr. Messrs. Henderson, Leo G. Robinson, J. R. Stewart and Messrs. James & Worthington competed against these, and whilst Mr. Parr succeeded in obtaining the senior honours in the bull classes, Mr. Leo G. Robinson's cow "Simple of Maisemore" was awarded the medal for the best animal of the breed on the show.

Granite veld farmers will, one feels sure, be interested to note the increasing popularity and strength of the Devon classes. Those who favoured this breed found plenty to select from, the more prominent owners being Messrs. Gwynne's Rhodesian Estates, J. E. Peach, W. F. White and De Beers Consolidated Mines, Ltd.

Major Bolitho, of Shangani, Mr. D. Williams, whose estate is in the neighbourhood of the Lonely Mine, and Mr. W. V. Fleming, shewed some excellent South Devons. De Beers Consolidated Mines were the only exhibitors of Sussex. Frieslands and the dairy breeds generally were weak, and were completely eclipsed by the beef types, around which the chief interest of the Bulawayo public is centred.

Sheep and pig classes, never strong at this show, were possibly rather better than usual, especially the pigs, which shewed a great improvement in quality. Messrs. F. D. Walker and T. Gordon Kay shewed a number of excellent woolled Persians, both pure and grade, while Messrs. A. G. Hay and H. S. Bawden provided the non-woolled Persians.

The Rhodesian Agricultural and Horticultural Society held their annual show as usual on 13th and 14th June. Following the example of the Bulawayo Society, they have decided to hold another meeting in August for slaughter stock and produce, so that the meeting under

review was confined to breeding stock only. The public were well aware that owing to the very short time that the Salisbury area has been free from quarantine regulations the show would not be large in point of numbers, but all were agreeably surprised at the outstanding quality of the beef classes, especially the Shorthorn bulls and the Aberdeen Angus. The Aberdeen Angus class was probably as creditable a display of the breed as was ever shewn in South Africa.

The pick of the Shorthorns were Mr. Woodforde's old bull "Prince Worcester" and his young bull "Raithby Blenheim," imported this year, and winner of the Thousand Guinea Trophy at Bulawayo, Mr. W. J. Woods' "Surnton Miracle," and Messrs. Campion Bros.' "Rosslands Forest Count." In the competition for the cup for the best bull in the yard, the Bulawayo judgment was reversed, and Mr. Woodforde's old bull was placed in front of his stable mate "Raithby Blenheim." Mr. Woodforde, therefore, holds the highest honours for the year at both shows. The decision naturally gave rise to a good deal of discussion, and it was generally agreed that the younger bull, "Raithby Blenheim," when shewn at Salisbury was not in the bloom and show order that he was at Bulawayo. "Prince Worcester" has gone to the British South Africa Company's herd at Shangani, and we shall look forward to seeing a good many of his progeny in prominent positions at future shows. We should like to have seen a great many more females in the Shorthorn classes. As it was, only three were shewn by Messrs. W. J. Woods and H. J. Searle respectively.

Mr. Evans's Angus bull "Pastime" was awarded the highest honours in the old bull class, and was also awarded the cup for the best bull of his breed. The black polled classes were materially strengthened by Mr. Duncan Black's recent purchases at Bulawayo and Bloemfontein, which included "Esquire of Swaylands," "Redoubt," "Eugenicist," and, in the female classes, "Bonny Keely Maid" and "Enflower of Breadsall."

We were glad to see quite a show of Devon bulls. With the exception of Mr. J. O. Gibson's "Hyfield Warrior," they were all the property of the Rhodes Inyanga Estate, and had been purchased a few months previously for that ranch from Mr. J. O. Southey, Varken's Kop, Cape Province.

Mr. Chas. Browning's old bull "St. Patrick," a grand animal, was the sole representative of the South Devon breed, whilst a cow and her heifers represented the Sussex breed for Mr. Glanfield. Mr. T. H. Newmarch alone upheld the honour of the Ayrshires with his bull "Douglas," bred by Mr. H. Gradwell, and probably the best Ayrshire bull in Southern Rhodesia at the moment.

Frieslands were represented by a bull and two cows, the property of Mr. H. C. H. Nangle, and a bull and seven cows and heifers from the Government farm at Gwebi.

The entries in the sheep classes were negligible, but a steady improvement continues in both the number and quality of the pigs shewn at this meeting. While, as above mentioned, no one expected a very great show this year, the quality and condition of the few animals exhibited

warrants us in the belief that the cattle-owning section of the public realise freely that showing is a part of their business, not a pastime, and that if it is to be done successfully, co-operation between those concerned must be brought into play.

We understand that a movement is on foot to bring about some form of federation or co-operation between the smaller shows in the province and the Salisbury show, with a view principally to eliminating unnecessary expenditure of capital and securing uniformity of action. Should this movement succeed, the advantages of united action in cattle matters throughout the province, and eventually possibly throughout the Territory, are too obvious to need emphasis here.

As a result of the decision of the show committees no agricultural produce was exhibited at either the Bulawayo or Salisbury show, but crops and produce are to be provided for at separate shows to be held in August. It was thought that this step might give grain farmers a better opportunity of exhibiting at a time when the whole of their produce had been harvested. The result of the innovation will be watched with interest. The gap thus left in the shows was to some extent filled by the exhibit of the Department of Agriculture, consisting of samples of most of the crops at present grown in the Territory, and of a number being experimentally tested, together with samples of soils and food stuffs with their analyses, and a display of the principal insect pests of the country. Included in this exhibit was a collection of indigenous raw materials which have a potential value for various industrial purposes, such as rope and bag manufacture, oil and drug extraction, etc.

The produce section at the Midlands Agricultural Show has shewn a marked improvement in quality and numbers in recent years, and this is all the more creditable when it is remembered what a series of bad seasons the district has passed through, and the earliness of the date of the show for produce generally. As usual, one of the leading features at this show is the competition for the cup offered for the best display of produce off a single farm, a competition rivalling in interest any other on the show, and one worthy of the attention of other show committees. This prize, for the second year in succession, was won by Miss Steedman, of Gando Farm, Gwelo, with a most meritorious collection of most things usually associated with the Rhodesian farm. Considering all the circumstances, the maize exhibits were good, and the improvement in the quality of the seed displayed should result in better crops for farmers in the district. First place in the maize classes was easily won by Morrisby Bros., who managed to secure eight first prizes in this section. In the other produce classes Mr. Bertram, of Holmdene Farm, and Mr. F. F. Hein shared most of the honours. Mention must be made of an exhibit of three bags of seed wheat shewn by Messrs. Meikle Bros., which was perhaps the finest sample ever seen in the country.

The produce classes at the Gatooma Show were fairly well represented, considering the earliness of the date. The best classes were those for maize, in which some of the exhibits would stand good chances of winning at the bigger shows. This applies particularly to some of Mr. H. F. Thompson's exhibits, which were prepared and selected with much care. In the other sections competition was not so keen, although the

quality on the whole was excellent. Most of the prizes went to Mr. G. C. Woodforde, Mr. J. Mack and Mr. H. F. Thompson, who are to be congratulated on their efforts in this direction.

The produce displayed at the Umtali Show has been uniformly good for a great number of years, and in the maize section it can be said with confidence that every year marks progress. It is also a gratifying feature to observe that new exhibitors make their appearance each year, although most of the prizes rather naturally fell to the older competitors —Mr. Maclean, Mr. Harvey and Messrs. Macdonald Bros.—who have played so large a part in the general improvement of the maize crop in the district. Among the new competitors who did well were the Farm Lands of Rhodesia and Mr. H. Curling, who succeeded in carrying off the prize for the best cob on the show with a magnificent specimen of 8-row Hickory King. The excellence of the produce displayed was not confined to maize, however, and competition in every case was keen, with numerous entries, and Messrs. Meikle, Norris and Kimpton are to be congratulated on obtaining such a number of prizes in the face of keen competition.

Export of Maize.

The public are reminded that grain for export is carried under "station to station" conditions, and where it is necessary to store grain awaiting shipment at Beira on Railway premises in order to release trucks, a handling charge of ½d. per bag for unloading and ½d. per bag for reloading out of shed into truck will be made.

E. R. ROSS,
General Manager.

Bulawayo,
3rd July, 1918.

New Crops for Rhodesia.

A REPORT ON THE EXPERIMENTS CONDUCTED AT THE AGRICULTURAL EXPERIMENT STATION, SALISBURY, 1917-18.

By J. A. T. Walters, B.A., Assistant Agriculturist.

In reviewing the work done and the results obtained at the agricultural experiment station, Salisbury, during any season, it is of importance to bear in mind the conditions under which the crops were grown. Thus, during the last season an unprecedented rainfall was experienced, following on three years of partial drought. In interpreting the results under review, use is made of previous records under different conditions, and a new crop may be condemned or recommended in consequence of its cumulative behaviour. Only rarely can any crop be recommended from one single year's experience. In some cases, as in that of Emmer, a crop which usually thrives under dry conditions, good yields were produced this season, in spite of the rain and rust. Here the crop is worth immediate experiment by the farmer. In almost every other case it is only after a series of trials that the farmer is recommended to try a particular crop to test its suitability to his local conditions.

Kikuyu Grass.—As late as a year ago it was mentioned in an article in the *Rhodesia Agricultural Journal* (June, 1917) that, despite all efforts up to then, no pasture grass had been discovered suitable for Rhodesia which formed a thick bottom and might prove useful for grazing purposes. Since that date, however, our trials with Kikuyu grass (*Pennisetum longistylum*) on the prevailing red soils of Mashonaland have shewn that this grass adapts itself perfectly to local conditions, and fulfils all the expectations that have been aroused from reports concerning its behaviour in the Union. The first lot of roots introduced by the Department of Agriculture were obtained from the Potchefstroom experiment farm in March, 1917. Through delays, these arrived in a seemingly dead condition, and after a preliminary soaking were planted out. Practically no rain fell after planting, yet by December, 1917, considerable growth had been made, and the runners became the source of our principal propagation plots. A further lot of slips were imported from Natal in December, 1917, and were planted out one foot apart each way. The resulting plot as it appeared in June, 1918, is shewn in the accompanying illustration. The slips soon covered the ground entirely, and the growth was so vigorous that the paths and adjoining beds were invaded. The spreading power of this grass is one of its most remarkable features, and not only does it spread along the

surface of the ground, but its runners penetrate downwards to a considerable depth in the course of a single season, making its hold upon the ground very firm, and rendering it hardy against tramping. In view of its known excellent feeding qualities, its vigour and its adaptability to Rhodesia, it can be confidently recommended. It is expected that slips in limited quantities will be available for distribution during the coming season.

Molasses Grass (*Melinis minutiflora*), now in its fourth year, continues to give satisfaction as a hay grass. The growth made by this grass seemed slow at the beginning of the season, but with the end of the rains it made rapid and prolific growth, flowering in May, being at its best for cutting as hay towards the end of that month or in June. The seed, however, was not ripe until July, when the flower heads turned grey. A test for hay made with this grass gave over $3\frac{1}{2}$ tons of dried hay per acre, which, satisfactory though it is, was considerably less than that obtained the year before. This is perhaps the best hay grass yet introduced to Rhodesia, a perennial, producing heavy crops of nutritious fodder, and capable of being cut at a period when the farmer is assured of fine weather for the work.

Indian Cane has amply fulfilled its earlier promise as a substitute for Napier fodder. It does not grow as tall as the latter grass. On the other hand, its stalks are never woody, but remain succulent down to the base throughout the winter. As propagation is easily effected both from cuttings and rooted slips, a number of plants will be available for distribution to farmers this season for experiment purposes. A photograph of this cane is shewn on page 328 of the *Journal* for June, 1917.

Panicum Grasses.—These are two native perennial grasses shewing great promise as vigorous producers of early green fodder. From a small beginning of a few plants there is now a fair sized plot at the experiment station produced by sub-division of the roots. The yield of hay from these plots is truly remarkable. Farmers would do well to propagate in the same way any of their native grasses which shew signs of outstanding excellence. The process is easy, and usually satisfactory from every point of view. Before undertaking the task, however, it would be well to send a specimen of the grass proposed for propagation to the Department of Agriculture for a report on its qualities

Sudan Grass (*Andropogon garawi*) has frequently been dealt with in this *Journal*. After the grass had been cut for hay, very considerable green growth was made this season during the months of May and June, affording excellent pasturage for cattle. This growth continued green up to the end of July. Teff grass, on the contrary, died away completely after being cut for hay in April.

Guinea Grass (*Panicum maximum*) continues to give satisfaction as a rank sweet grass for fodder purposes in bulk or for ensilage, and both roots and seeds are now available in limited quantities for trial.

Leguminous Fodders.—The need of providing a leguminous fodder for better class cattle and dairy animals is too well known to the farmer to need emphasising.

Kikuyu Grass, May, 1918, from slips planted out December, 1917. Agricultural Experiment Station, Salisbury.

Hibiscus cannabinus, Indian variety. Agricultural Experiment Station, Salisbury.

Emmer Wheat, harvested June, 1918. Agricultural Experiment Station, Salisbury.

"Painted Lady" Bean—a promising new variety. Agricultural Experiment Station, Salisbury.

Niger Oil Crop (*Guizotia oleifera*), ripe for harvest. Agricultural Experiment Station, Salisbury.

Niger Oil Plant after threshing, shewing straw off one-quarter acre. Agricultural Experiment Station, Salisbury.

Velvet Bean (*Mucuna utilis*) is now almost universally grown for this purpose with very satisfactory results. Among other fodders of this class experimented with last season was one produced from seed supplied by Mr. Cyril Allen, of Lalapansi. This is a bean known as the "Painted Lady." Planted in December—too late for this class of plant—it yet produced a yield of fodder far exceeding the three varieties of velvet beans under trial. An idea of the bulk of fodder may be obtained from the accompanying illustration. Propagation and tests on a bigger scale will be possible this coming season, and the results will be watched with interest.

Kudzu Vine (*Pueraria thunbergiana*).—This plant resembles the velvet bean in most respects, and possesses the additional advantage of being a perennial. Attempts at propagating this useful plant have, however, not yet been a success. No flowers or seed have been produced, and the plants generally lack the extraordinary vigour which characterises it in other countries.

Wild White Clover.—Although practically all the clovers fail to survive under Rhodesian conditions, this variety was advertised as likely to withstand tropical conditions. Seed was obtained from two sources, but in spite of careful preparation and a season seemingly favourable for this class of crop, no useful result was obtained, and Rhodesian pastures seem destined to continue deprived of clovers as a constituent, the only substitute for which up to the present is Beggar Weed.

Bean Crops.—The Haricot and Canadian Wonders have been staple bean crops in Rhodesia for many years. Yields, however, are extremely uncertain, although prices as a rule are satisfactory. Experiments have been undertaken of late years to determine the possibility of growing other types of beans. Three varieties of Indian beans have been experimented with of a type differing from our ordinary beans, and resembling the lentils in general appearance. These are the Mung, Matt and Urd beans (*Phascolus spp.*). Of these, the first only—Mung (*Phaseolus radiatus*)—has made satisfactory growth under local conditions during the past season, covering the ground well and keeping free of disease. Mung is a small green pulse highly esteemed as human and cattle food in India, and is the first lentil that has given satisfaction in Rhodesia. Data with regard to yield are not yet available here, but Indian yields do not exceed about two bags per acre. Indian traders who deal in this article are prepared to buy at 3d. per lb., and as the crop is a deep rooting legume, it may be of considerable use for rotation purposes.

Dhal.—Early Varieties.—As an alternative to the ordinary bean crops of this Territory nothing has as yet surpassed the Common Dhal (*Cajanus indicus*) in those localities where it thrives. Unfortunately, in some districts early frosts are liable to cut down the plant before the seed is ripe. To obviate this, a large number of early varieties are now under trial at the agricultural experiment station. These early varieties have the disadvantage of being lighter in yield, smaller in growth and shorter lived than the common dhal, and are consequently only to be recommended where, owing to early frosts, the cultivation of the latter crop is risky. Of nineteen new varieties introduced last season, only two or three are likely to prove useful to us.

The Tepary Bean continues to give satisfactory results, but propagation has not been sufficiently extensive to make distribution possible. Reference was made to this bean on page 330 of the *Journal* for June, 1917.

Oil Seeds.—*Niger Oil* (*Guizotia oleifera*).—This crop has been noticed in previous articles in this *Journal*, where its adaptability to Rhodesian conditions and its freedom from pests had been remarked upon. This season, for the first time, a definite acreage was put down with a view to finding the exact yield of seed obtainable per acre. As usual, the plant growth was extraordinary, and several of the farmers who saw the standing crop were of opinion that it would probably be unsurpassed as a green manuring crop, even if it were good for nothing else. Our illustrations give an idea of the luxuriance of the green growth obtained and the amount of dry stuff remaining after the seed had been threshed out. It is almost impossible to avoid loss in harvesting seed of this kind, yet the clean seed obtained from this quarter acre plot amounted to 350 lbs., or an equivalent of about seven bags per acre —a truly remarkable yield of this fine oil-bearing material. In a report issued by the Imperial Institute in 1914, the seed was valued in the United Kingdom at 36s. to 38s. per quarter (416 lbs.), but it was pointed out that it might fetch a higher price in Marseilles, where it is employed for the manufacture of edible oil. Seeds of this crop will be available for distribution this coming season.

Linseed.—A number of successful sowings were made with white-flowering Linseed, with the following results. The wet season seemed on the whole favourable to this crop.

	Yield per acre.
Sown 17th December, 1917	400 lbs. clean seed
,, 7th January, 1918	216 ,, ,,
,, 21st January, 1918	200 ,, ,,
.. 5th February, 1918	320 ,, ,,

Sunflowers.—These made a wonderful recovery after the rain, in spite of a poor start, and the crop on the 1st May was very promising. The yields obtained were as follows:—

Sown 42 in. by 18 in. between plants	1,280 lbs.
.. 36 in. by 12 in. between plants	1,304 ,,

The Black Russian variety of seed was used, as it has proved, after several years' trial, to be consistently and very markedly superior to the grey striped variety.

Cowpeas.—The cultivated varieties of Cowpeas very frequently fail to thrive in this country, owing to the attacks of the stem borer, although cases are reported of excellent crops being produced. The native Cowpea (*Nyamba*), on the other hand, seems highly resistant to those pests which ruin the imported variety. Of these native beans, there are several distinct strains, and these are now being experimented with. From a preliminary trial conducted this season there is every reason to hope that by selection strains may be isolated which will mature with a fair amount of uniformity.

Hibiscus Cannabinus.—This indigenous fibre plant is much used in India in the manufacture of hemp. One of the improved Indian strains was obtained for trial in this country. Excellent germination and good growth was obtained at the experiment station, as will be seen from our photograph. Unfortunately, it failed to adapt itself to the dull sunless wet conditions of last year in the matter of setting seed, and for further experiment seeds will have again to be imported. The fibre obtained from these plants is being examined and will be reported upon later.

Datura Stramonium (Stink Blaar).—This plant, which occurs as a weed all over Rhodesia, contains a valuable drug which is in much demand at present on the European market. An attempt to grow this plant as a field crop was made in 1916-17, and its failure there was attributed to the prevailing drought. The attempt was repeated this last season on fertilised ground, but in spite of rain and fertiliser, this weed, which grows so luxuriantly where not required, failed to respond to cultivation, and the crop obtained was small. This is all the more regrettable, as specimens of the leaf forwarded for examination and report to the Imperial Institute proved very considerably richer in the valuable alkaloid than European specimens. The report states that "the Rhodesian sample contained 0.68 per cent. of alkaloid on the dry material, while Indian and European leaves have been recorded to contain 0.45 per cent. It will thus be seen that the present sample of Stramonium leaves from Rhodesia is unusually rich in alkaloid." The sample was valued at from 85s. to 90s. per cwt., delivered in London.

Emmer.—This is a variety of wheat differing from the ordinary sorts, in that its seeds can only be threshed with difficulty, and that its ears break up into small segments when handled. It is known botanically as *Triticum dicoccum*. In America and on the continent of Europe it is grown as stock food, both the grain and straw being utilised separately, or the plant cut for hay when flowering. A trial plot of one-quarter acre at the experiment station this last season was a great success, the crop entirely escaping rust, and producing a large quantity of both grain and fodder. Sown on the 4th January, the stand was in full ear, although the straw was still green, on the 1st May. The photograph shews the stand at that date. When finally cut, it yielded 1,140 lbs. of grain and 7,156 lbs. straw per acre. The seed thus produced will be available for distribution for trial this coming season.

(To be continued.)

Extracts from the Report of the Director of Agriculture

FOR THE YEAR 1917.

(*Continued.*)

Presented to the Legislative Council.

As regards the development of the Department, there is unfortunately little to record. Expansion is difficult under existing conditions; indeed, it is not easy to maintain all our activities in operation with so many members absent on war service and with the strict necessity for financial economy. It has not been possible to cope with all calls, but the public seem to realise the exceptional difficulties of the present time and to exercise patience in the circumstances. The visiting of farms and tour of districts, so very helpful in bringing departmental officers in touch with the needs of different districts and with individual farmers, has had to be materially curtailed. This applies to all branches alike. A satisfactory feature in this connection, however, is the large numbers of farmers who visit the experts in their offices, although advice so given is not equal to that furnished on the spot. Farmers' meetings were attended and lectures given by the staff as far as possible, but not to the extent usual in the past.

The Votes were not fully expended, as strict economy had to be practised. During the year the transfer to the Administration was decided upon of the Matopos and Inyanga Estates, left by Mr. Rhodes for the benefit of the people of Rhodesia, and particularly so in an agricultural sense. The care of these estates has been committed to the Department of Agriculture, and separate reports on the subjects have been furnished.

Matters relating to the live stock industry of the country, by far the most important side of our agriculture, have hitherto been the object of the special attention of one advisory officer of the Department, who has dealt with the breeding, care and feeding of cattle, sheep and pigs, with dairying in all its varied branches, and with poultry and the development of markets for all classes of animal products; in fact, anything relating to farm live stock, other than questions of disease. A scheme for the settlement of soldiers released from service was devised, approved and set in operation, the first steps being the

selection of land, which received considerable attention; and the formulation of conditions of settlement and organisation of the scheme. From the Department of Agriculture Mr. R. C. Simmons has been specially selected for a new appointment in connection with the settlement of soldiers and sailors, and he was seconded as from 1st September. He has most considerately continued, when time would permit and in the absence of a successor, to furnish advice on subjects with which he has hitherto dealt departmentally.

At the commencement of the year there were thirty-six Pounds, and of these one has been closed, whilst three new ones have been established. During the year the scale of pound fees was revised with a view to securing a more uniform and equitable scale.

The work of the agricultural branch has been carried on for the third year, in the absence of the Agriculturist, by his assistant. No expansion has, in the circumstances, been possible. The experimental work at the Salisbury laboratories is bearing fruit. Out of the 300 trials in progress, there are interesting and important results accumulating. Facts and figures are made public through the *Agricultural Journal*; suffice it here to say that a number of new crops are giving every promise of success. Several have now proved sufficiently encouraging to justify trial on a commercial scale at the Government farm, Gwebi, and these are being distributed, as far as supplies permit, for more extensive trial by farmers in various parts of the country. Amongst those more particularly worthy of mention are such new crops as cassava, broom corn and field radish, and of forage crops, Sudan grass, molasses grass, Kikuyu grass, cow cane and native panicum, whilst Napier fodder is now so generally grown as to have passed entirely out of the experimental stage.

Special matters attended to by this branch included maize grading, distribution of seed for farmers' experiments, encouragement of wheat production, besides the usual botanical matters, lectures and agricultural shows. Maize grading has become an important function of the Department, for which it is necessary to employ additional staff for some four months. It is unfortunately necessary to train the men specially for the work each season, as they are only temporarily engaged. The quantity examined by the graders was 396,364 bags, and of this it was gratifying to find that 55.5 per cent. was first grade, as compared to 44.1 per cent. the previous year.

Enquiries from various sources regarding more purely botanical matters, identifications, uses, dangers as weeds or as poisons, and similar points, are becoming increasingly numerous, and there is great scope for useful research in this direction, but owing to want of staff it is impossible to do as much as is certainly desirable. There is much experimental agricultural research obviously wanted which it is impossible under existing conditions to carry out, particularly studies of our indigenous plants, useful and harmful, investigations of local problems, such as crops for our magnesian soils and for the sand veld, also the development of industrial products of maize and other farinaceous

plants, of fibres, such as cotton and hemp, broom corn and the like. Some assistance has been given to the Melsetter farms for the investigation of certain problems connected with coffee, but there is room for much more of this class of work than staff and funds at present permit.

The forest nursery at Salisbury continues to furnish seedling trees and shrubs to the public at low prices, to encourage an interest in forestry and increase the amenities of our homesteads. Trees and shrubs to the number of 72,445 were disposed of to the public and 28,012 issued free to various Government institutions, a total credited value of £409. There would have been a considerably greater demand but for the dry spell of weather at the height of the season for tree planting. To serve the western end of the country, this work, which has proved so popular at Salisbury, is being continued on the same lines at the nurseries connected with the park in the Rhodes Estate, Matopos.

The results of agricultural experiments conducted at the Government farm on the Gwebi will be found, by those interested, detailed in the pages of the *Agricultural Journal*. It is sufficient to say here that the experiments have been successfully continued, although results were somewhat affected by the unfavourable season. There are fifty separate enquiries in progress, involving eighty-two plots, and thirty-nine different crops are grown, from which facts some idea may be formed of the complex nature of the work carried on. About 500 acres are now under the plough, and the resulting crops are considerable in quantity and value. In all undertakings the first importance is attached to the elucidation of some point sought, and to accuracy in the measurement of land and of yields, extra cost being entailed to this end beyond what would be spent on an ordinary farm. Furthermore, the produce of the farm is distributed free or at low prices to farmers, to induce them to make trials on their own land, whilst what cannot be so disposed of or used on the farm is consumed by other Government institutions. No development of the farm in the way of buildings, equipment or live stock took place during the year, though there is room for much improvement in these directions to increase the usefulness of the farm, to render it more efficient in its object, and more instructive and attractive to the public.

The market value of crops grown was £3,175, of which there was retained for use on the farm, for rations, fodder and seed, grain, roots, hay, silage, etc., to the value of £1,665, the remainder being sent away.

The total costs in connection with maintaining the Government experiment farm, Gwebi, and the proceeds are given below to the nearest pound:—

Receipts.

Sale of produce	£754
Profit on live stock and wool	244
Produce issued to Government Institutions	231
Produce distributed free to public	358
	£1,587

Expenditure.

Salaries	£536
Expenses (unaudited)	1,192
P.W.D. repairs	12
	£1,740

It is no object of an agricultural experiment station to pay its way; the entire value should rest on the information gained and given to the farming public, but the above figures shew that the Gwebi farm is conducted at low cost to the country, and is a justification for its more adequate equipment to fulfil the objects for which it exists.

During the year the farm was inspected by ninety visitors, whilst two farmers' associations arranged a visit by their members, a practice deserving of encouragement. A strong demand has arisen amongst the farmers for a similar agricultural experiment station on the sand veld.

The Friesland herd kept on the Gwebi farm numbered, at the end of 1917, one stud bull, thirty-five cows and heifers, seven calves and nine young bulls for disposal. The original herd of nineteen head cost in 1913 £601 5s., and the bulls since bred have commanded a ready sale from time to time. These cattle were not purchased out of administrative funds, and the proceeds of sales have been set against repayment. The circumstances of the purchase at the time justified the step, and the sale of bulls at comparatively low prices has undoubtedly been a benefit.

The Merino flock has been maintained, and rams supplied to farmers, but continued trial confirms the impression that the Merino sheep is not well adapted to the conditions of heavy seasonal rainfall, stagnant pools, rank grass and the liability to blue tongue, fluke and wireworm. Only a small flock, worked in close conjunction with the cropped land on the farm, is feasible, and when less intensive pastoral methods are attempted mortality commences. By restricting the numbers, it is hoped to keep a small flock in good condition, and to continue to supply rams, although when opportunities admit a change to a robust mutton breed is for experimental purposes desirable.

The Citrus Adviser visited 155 farms during the year, and by invitation went to Northern Rhodesia to report upon citrus prospects there, and also to Portuguese East Africa.

Entomological research was continued, though in a diminished degree, owing to the absence of an assistant at the front. Perhaps the most important investigations have been those connected with the existence of tsetse fly in Portuguese territory close to our eastern border, the reports regarding which, so far as likelihood of extension westward is concerned, are of a reassuring character. The entomological branch undertakes the inspection of fruit and plants imported into the Territory. Inspection under the Nurseries Ordinance was also carried on successfully. In preparation for a possible locust invasion, stocks of spray pumps, arsenic and sugar were overhauled and put in order. In

this connection consideration is being given to the advisability of introducing special legislation to deal with this menace.

The senior Chemist has throughout the year been absent at the front. His assistant was absent on sick leave during the early part of the year, and subsequently was compelled, for reasons of health, to retire from the service, so that he was only actively engaged for little over half the year. An assistant has been specially employed throughout the season in connection with the control of dipping and examination of specimens in cases of suspected arsenical poisoning. To this end he has examined 1,622 dip samples and 109 morbid specimens, besides such other examinations as time allowed. Chemical research has thus been seriously interrupted this year, but steps have been taken to resume these activities. The laboratory accommodation is still far from satisfactory.

The time of the Agricultural Engineer was, as usual, largely devoted to visiting farms, advising upon irrigation schemes where necessary, laying out same, furnishing drawings and specifications. In addition, attention was given to applications for rights under the Water Ordinance, attendance at water courts, the charge of meteorological observations all over the country, lectures and correspondence. The applications for advice far exceeded the powers of two engineers to meet, and when one left for active service, this class of work fell even more into arrear, whilst the untimely death of Mr. Watt left the Department at the close of the year entirely without the services of an irrigation expert.

Under the provisions of the "Water Ordinance, 1913," no fewer than 112 applications for definition of rights to water were received, of which 50 were granted, 38 were pending and 26 were refused by the water courts, suspended or withdrawn. During the year there were 24 new applications and 22 grants made. In July the first irrigation board in the country, that for the Odzani River, was constituted. A commencement was also made with the construction of a dam at the Mazoe Poort for the purpose of conserving water for the irrigation of the valley below, particularly the citrus plantations of the British South Africa Company. When completed, this will be by far the largest storage reservoir in Southern Rhodesia.

The system of collection of statistics, under the Ordinance of 1914, has worked smoothly, and the information issued has been much appreciated, and is of considerable service to the Government, the farmers and the general public. The publication of stock and crop returns is now eagerly looked for, and has undoubtedly exercised a beneficial effect in regulating markets, in preventing undue speculation, and in keeping all interested informed as to probable and actual supplies in the country. Returns from farmers are received with regularity, but there is always some delay in respect of a certain small proportion, which hinders the prompt publication of figures, and entails a large amount of extra work in issuing reminders and checking lists. Returns relating to live stock, animal products, tanks and acreages ploughed are called for each January, whilst yield of crops, citrus trees and silos are enumerated in September. As soon as all returns are in, they are collated by districts and published as early as possible.

A directory of all the farmers in Southern Rhodesia with their postal addresses, the first to be produced, was issued during the year, and it has been much in request, although naturally in process of time, additions, deletions, changes due to removal and death, inevitably call for constant revisal and correction. From the data collected, and without betraying individual figures in any instance, valuable information has been furnished to the International Institute of Agriculture at Rome, to foreign consuls, and the African Coast Fever Commission, whilst the figures collected and published are constantly referred to for official purposes. It is encouraging to find a keen interest taken by the farmers in the statistics of their industry, and, with only a few exceptions, a growing appreciation and willingness to furnish returns.

The report of the Chief Veterinary Surgeon dealing with the operations of that Department is attached. Progress has been made, though not as much as might be wished, with the erection of new veterinary laboratories at Salisbury on the site reserved and laid out for this purpose. Besides routine work, the Veterinary Bacteriologist has continued, so far as means permitted, researches upon certain of our animal diseases, notably horse-sickness, plasmoses of cattle and tests for contagious abortion.

A method for the immunisation of horses against our chief equine malady, horse-sickness, has been under investigation for several years, and latterly promising results have been obtained, in so far that a large number of inoculated Police horses appear to have withstood attacks of disease which might certainly have been expected to have proved fatal had they not been so fortified. The immunity thus apparently conveyed is not complete, but seems to have given a very large measure of protection, and to be well worth securing. The horses of the Police were used for trial, as their history can be traced, and proper records kept of their career and the risks incurred. There is reason to hope that the further prosecution of these researches may ultimately lead to a treatment as effective at that now generally applied to mules.

In the highest service to their country we have lost Capt. Veterinary Surgeon Lowry, who died in Mesopotamia; Captain J. M. White, in Flanders; Cattle Inspector Curran, killed in East Africa; Lieut. N. H. A. Ready, who died of wounds received whilst in charge of a tank on the western front; and Mr. Harry Comaroff, of the Department of Agriculture, died of fever whilst on active service in East Africa. Death has also taken, at the early age of thirty-nine, Mr. W. Martin Watt, who had come to be well known to the farmers of Rhodesia for his skilful and practical advice in the laying out of irrigation schemes and his earnest devotion to duty. He was largely instrumental in framing the water law of 1913, which lays down the principles upon which all matters of irrigation will in future be conducted. The results of his work, both in this way and in the schemes he planned and carried out, will long live after him. The death has also to be recorded, with deep regret, of Mr. George Pinchin, Government Veterinary Surgeon, who died at Bulawayo on 12th May. He had been in the country since 1910, and his untimely end at an early age cuts short a useful and promising career.

The following members of the Departments are on war leave:—

Agricultural Dept.

C. L. Robertson
R. L. Thompson
W. E. Meade
H. G. Mundy
E. Hope Carson
E. E. Burt
E. V. Buxton
E. E. Philip
G. N. Blackshaw
J. Muirhead
Miss E. Knight

Veterinary Dept.

G. Ledeboer
J. Donohoe
A. G. Crisp
J. C. Mathews
P. Curran (killed)
G. Honey
A. J. Parkes
A. E. Hills
P. H. Krige
J. H. Tilley
G. H. Sharpe
C. F. Johnston
C. McMahon
A. G. Stanbury
H. E. Evans
W. E. Gilbert
J. M. White (died)
B. A. Myhill
H. C. Lowry (died)

The resignation of the Assistant Agricultural Chemist, Mr. A. G. Holborow, has to be recorded. In connection with the Rhodes Bequest, Mr. W. E. Dowsett, Curator of the Matopos Park, and Mr. Bertram Woods have been transferred, and Mr. H. C. Michell continues as manager at Inyanga, with Mr. Barnes as assistant in charge of orchards and plantations. A number of ladies are temporarily employed in place of clerical officers on active service.

In conclusion, I must express my keen appreciation of the manner in which officers of all branches have applied themselves to their work. Throughout, there has been evidence of a desire to carry out, though short of men and means through the war, the many activities of the Department energetically and efficiently, frequently at considerable sacrifice of their leisure.

Abridged Report of the Chief Veterinary Surgeon

FOR THE YEAR 1917.

African Coast Fever.—*Salisbury District.*—No cases of disease occurred on the four farms regarded as infected at the beginning of the year. A fresh outbreak occurred on the farm Waterfall, eight miles from Salisbury, on the Charter road. Short-interval dipping was at once instituted, and the farm fenced with commendable despatch. Notwithstanding these measures, and also short-interval dipping on adjoining farms, the disease appeared on two of the latter several months afterwards.

Mazoe District.—No cases occurred during the year, and all restrictions were removed, except from the fenced and cattle-free farm on which the disease occurred the previous year.

Mrewa District.—In February a slight extension of infection occurred in the Mangwendi reserve. One beast died, and the remainder of the herd, 17 head, was destroyed.

Melsetter District.—At the beginning of the year there were 24 infected farms. During the first quarter 39 head died on six of these, since when there has been no case of Coast Fever in the district. Reference must, however, be made to a reported suspected case on the farm Helvetia in May; unfortunately the films prepared for microscopic examination were unsuitable, but, taking all the circumstances into consideration, there is good reason for believing that it was not a case of Coast Fever.

Umtali District.—A fresh outbreak occurred on the farm Engwa, in the southern part of the district. The degree of infection was most intense; out of 149 head involved, only 37 remain. There is no doubt that this outbreak was the result of a movement of cattle, under somewhat peculiar circumstances, from the southern part of Melsetter district two years previously, and that the existence of infection during this period was masked by the use of a dipping tank. Fortunately, the infected area was in a very isolated position, and no extension of infection took place.

Gwelo District.—No extension of infection occurred, but on the two infected farms a slight mortality occurred during the earlier months of the year.

Victoria District.—After over eleven years' freedom from disease, an outbreak occurred on the farm Lounton, situated in an isolated

position away from any main road or path, and over 100 miles from the nearest centre of infection. Shortly afterwards infection was discovered amongst cattle on three immediately adjoining farms, and after a lapse of several months on two farms within a few miles, and on the Victoria commonage about 25 miles distant.

General.—The number of fresh outbreaks during the year was 13, with a mortality of 43 head, as compared with 20 and 382 respectively for the previous year.

Short-interval dipping is one of the most effective methods at our disposal of dealing with Coast Fever. "No ticks, no Coast Fever," is axiomatic, but under local conditions the former state is impossible of achievement. The complete eradication of infection is possible, however. It has been eradicated from many districts in Rhodesia and the Union, and it can be eradicated from those in which it at present exists. I have no hesitation in saying that if every area carrying infected ticks could be accurately defined, the disease would be eradicated within a period of two years by our present methods. It may well be asked why these areas cannot be so defined and dealt with. The reply is, to my mind, very simple. In the majority of cases the disease has been in existence for several months (two years in the Engwa case) before it is brought to our notice; meantime infection has been disseminated which may, and frequently does, not manifest itself for another extended period, and so the cycle goes on, with the result that we are generally at the heels of the disease instead of in front of it. In dealing with the outbreaks, the known infected areas are a comparatively simple proposition, the unknown and unsuspected we cannot combat. To remedy this state of affairs, universal compulsory effective dipping of cattle throughout the Territory has been proposed. Whilst the value of the proper use of the dipping tanks is fully recognised, it may be stated, as a fact and not as a matter of opinion, that weekly dipping, however effectively practised, will neither eradicate Coast Fever nor prevent its spread. It is true that as ticks are reduced in numbers by dipping, the chance of the disease being propagated and disseminated is correspondingly lessened; at the same time dipping may mask infection for an indefinite period, and result in recrudescences on areas where it had been regarded as a thing of the past and in fresh outbreaks on previously clean areas. This point of view is clearly and concisely expressed in the supplementary report of the African Coast Fever Committee, as follows:—"Such dipping may prevent any noticeable number of deaths when Coast Fever exists, yet cattle moved from such areas may and have been the cause of carrying the infection with them."

These remarks are not to be taken as reflecting any doubt in the writer's mind as to the value of dipping as a general prophylactic measure; they are simply intended to forestall the disappointment which is bound to result if a scheme of universal compulsory dipping at seven-day intervals is relied upon for the eradication of Coast Fever.

Quarter-Evil.—The mortality from this disease, which began in November, 1916, persisted throughout the year, in Matabeleland a total of 133 deaths being reported.

ANTHRAX.—Three outbreaks occurred on farms in the Mazoe and Salisbury districts. The diseased carcases were cremated, and the in-contact animals (615 head) vaccinated. The total mortality was nine head.

TUBERCULOSIS.—Although no case of the disease came under the observation of the Department, several head of Rhodesian cattle shewed tuberculosis lesions on *post-mortem* inspection at the Johannesburg abattoirs.

CONTAGIOUS ABORTION.—The existence of infection was diagnosed in four herds. Unfortunately, there is no satisfactory method of treatment capable of adaptation to local circumstances, but as far as possible infected animals are isolated, the aborted fetuses destroyed, and the farm or area involved placed in quarantine for an extended period.

FLUKE DISEASE OF CATTLE.—This affection appears to be increasing; during the drought a heavy mortality occurred in various districts. A few animals were treated with *extractum liquidum filicis*, B. P., with most promising results. Owing to shortage of staff and the difficulty of obtaining this material, the observations could not be carried on; they will, however, be resumed when conditions are more favourable.

HORSE-SICKNESS.—The total mortality reported was 107 head, mostly horses. As most of the mules in the country, and a considerable number of horses, have been immunised, and as many horses possess a certain degree of resistance from several years' exposure to infection, this mortality indicates a very heavy infection during the season.

SHEEP DISEASES.—Very few cases of blue tongue occurred, and these were of a mild nature. A slight mortality, less than 3 per cent., occurred on one farm in the Melsetter district.

RINDERPEST.—Early in the year reports were received from Veterinary Officer Hooper Sharpe, attached to General Northey's column in East Africa, that as a result of the many movements of cattle caused by the military operations, rinderpest infection was spreading towards the border of Northern Rhodesia. Full reports of the excellent work done by this officer under the most trying and difficult conditions have already been submitted. The magnitude of the work of dealing with rinderpest in such a large area, and the menace to the whole of South Africa by the southward spread of infection, were realised by all the Administrations concerned, and Mr. C. E. Gray, Principal Veterinary Officer of the Union, was appointed Commissioner-in-charge of operations, and proceeded to East Africa with a staff of veterinary surgeons and complete equipment. The latest reports shew that satisfactory progress has been made in combating the disease, and that there has been no further extension southward.

AFRICAN COAST FEVER.—Infected Areas and Mortality, 1917.

District.	Area.	Original No. of Cattle.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Salisbury ...	*Fresh Outbreaks—*														
	Waterfall ...	289	—	—	—	—	11	—	—	—	—	—	—	—	11
	Hopley ...	240	—	—	—	—	1	6	1	3	—	—	—	—	11
	Highfield ...	46	—	—	—	—	—	—	—	—	1	—	1	—	2
Gwelo ...	*Existing Outbreaks—*														
	Riverbend ...	—	—	—	3	—	—	—	—	—	—	—	—	—	3
	Cross Roads ...	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Mrewa ...	*Fresh Outbreaks—*														
	Mangwendi Reserve	18	—	1	—	—	—	—	—	—	—	—	—	—	1
	Existing Outbreaks—														
	Mangwendi Reserve	—	17	—	9	—	—	—	—	—	—	—	—	—	26
	Exeter ...	—	14	—	4	—	—	1	—	—	—	—	—	—	19
Umtali ...	*Fresh Outbreaks—*														
	Engwa ...	149	—	—	—	—	—	86	4	5	4	1	—	—	100
Melsetter...	*Existing Outbreaks—*														
	Cecilton ...	—	1	—	—	—	—	—	—	—	—	—	—	—	1
	Woodstock ...	—	1	1	1	—	—	—	—	—	—	—	1	—	3
	Wolverhampton ...	—	6	9	3	—	—	—	—	—	—	—	—	—	18
	Kronstad ...	—	1	1	1	—	—	—	—	—	—	—	—	—	3
	Weltevreden ...	—	5	4	2	—	—	—	—	—	—	—	—	—	11
Victoria ...	*Fresh Outbreaks—*														
	Lounton ...	110	—	—	—	—	29	24	—	—	—	—	—	—	53
	Glenlivet ...	222	—	—	—	—	—	11	6	2	3	1	1	2	26
	Erichsthal ...	1,189	—	—	—	—	—	21	21	4	37	—	—	7	90
	Midwaters ...	13	—	—	—	—	—	2	3	1	1	—	—	—	7
	Commonage ...	924	—	—	—	—	—	—	—	—	2	—	1	3	6
	Msari Reserve ...	147	—	—	—	—	—	—	—	—	—	—	18	10	28
	Arawe ...	812	—	—	—	—	—	—	—	—	—	—	4	4	7
	Beza ...	194	—	—	—	—	—	—	—	—	—	—	5	5	10
	Monthly Totals ...	—	46	16	23	—	41	151	35	15	48	2	30	31	438

QUARTER-EVIL

Mortality during 1917.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Plumtree ...	109	14	12	14	16	20	19	15	32	36	11	7	305
Matopos ...	—	6	21	24	10	34	11	19	16	28	2	7	178
Figtree ...	—	—	—	—	—	—	—	7	—	—	—	—	7
Heany Junction ...	—	—	—	—	181	66	4	1	—	—	—	—	252
Inyati ...	—	—	—	—	3	19	72	161	36	33	12	6	342
Umzingwane ...	—	—	—	—	10	—	2	3	—	—	—	—	15
Nyamandhlovu ...	—	—	—	—	—	8	45	7	7	—	—	—	65
Bulawayo ...	—	—	—	—	—	—	24	21	9	1	1	2	58
Insiza ...	—	—	—	—	—	—	31	23	18	5	2	—	79
Gwanda ...	—	—	—	—	—	—	—	—	27	—	—	5	32
Monthly Totals ...	109	20	33	38	220	147	208	257	145	103	28	27	1,335

Cutworms.

By Rupert W. Jack, F.E.S., Government Entomologist.

Part II.

Preventive Measures.—Methods which aim at avoiding attack are the direct outcome of a knowledge of the factors which influence cutworm outbreaks. In regard to certain classes of crops nothing very much can be done, whilst in regard to others preventive measures are eminently practicable.

(1) *Dry Season Crops, Seed Beds, etc.*—As already stated, attack on irrigated crops, such as potatoes, during the dry season cannot well be guarded against, owing to the fact that the eggs are laid on the crop itself. At present no method of preventing such egg-laying is known. It is likely, however, that dirty lands are more liable to severe attack than clean ones, and, therefore, weeds should be kept down from the first. Heavy loss is especially likely to be experienced if weeds are allowed to grow for a time, and are then destroyed by cultivation, leaving only the potato or other plants for the cutworms to feed upon.

Tobacco seed beds are very liable to attack from cutworms, and in most cases the eggs are laid amongst the very young plants. Injury is particularly severe, owing to the length of time the plants remain in the seedling-leaf stage. Such plants may be severed and demolished by very small cutworms, whilst the latter gain size and strength quicker than the plants. Consequently the damage is continuous. This form of attack can largely be prevented by very careful attention to the covers. The pieces of cloth should be sewn together to form a solid piece over the whole bed, and any holes should be immediately repaired. The bricks should be well joined, quite level and free from gaps along the top. The cloth should be carefully weighted down, so as to leave no aperture through which a moth could enter. The cloth should always be replaced before sundown, for although eggs laid during the hardening-off process are of considerably less moment than those laid whilst the plants are very small, they are still undesirable. Furthermore, the practice is of value in connection with other pests. Seed beds may also be attacked by cutworms which make their way in from the surrounding veld. For convenience in connection with the water supply, the beds are commonly made close to permanent water in a vlei situation, and during September and October the surroundings may harbour cutworms in considerable numbers. A fairly wide space of bare ground around the seed beds should help to check invasion, whilst